ESSAYS ON CORPORATE FINANCE

BY

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DISSERTATION

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# ABSTRACT

This dissertation contains two chapters that are related with corporate finance and law. Below are the individual abstracts for each chapter.

*Chapter 1: Do Patent Lawsuits Cause M&A? An Experiment Using Uncertain Lawsuits*

I investigate whether there exists a causal relation between result of a patent lawsuit and alleged infringer's subsequent M&A activity. I find that if the court gives an infringement decision, then the infringer sharply increases spending on focused M&A and decreases on diversifying M&A. Moreover, the infringer specifically acquires targets that have substitute patents so that it can redesign its products or form a shield against future lawsuits. Patent motivated acquisition channel is new to our literature and different than the traditional knowledge transfer channel. For the experiment, I hand collect detailed data on all patent lawsuits that were appealed to Court of Appeals for the Federal Circuit (CAFC). In this court, decisions are given by majority in randomly assigned 3 judge panels. In a setting that resembles regression discontinuity design, I use only the lawsuits where there was a dissenting judge (i.e, decision was given by 2 to 1). Since CAFC is the only appellate court for patents and has federal jurisdiction, my experiment is not subject to endogeneity problem stemmed from court selection. This is the first paper to use dissenting judge lawsuits for identification strategy. The same approach be can be generalized to other types of litigations.

*Chapter 2: Do Uncertainties in Bankruptcy Law Affect Optimal Loan Contracts? A Quasi Natural Experiment*

I investigate whether uncertainties in bankruptcy procedures shape financial contracting in the U.S. syndicated loan market. Utilizing a novel hand-collected data set, I exploit

the application of substantive consolidation procedure in the U.S. bankruptcy courts. This procedure has two unique features. First, it removes seniorities granted in the original contracts, resulting unexpected huge losses on unsecured bank loans. Second, there is consensus among practitioners that its application is unpredictable since there is no specific provision in the U.S. Code. I find that after exposure, lenders transmit this shock to other clients as requiring collateral more often in their new loans. Moreover, if exposed lenders issue new unsecured loans, then they demand higher interest rate and tighter covenants, even controlling for bank capitalization, borrower and time fixed effects. To my knowledge, this is the first paper to show that uncertainties in the bankruptcy procedures provide an important friction in the loan market. Furthermore, this work complements the previous literature by providing a new channel for the determinants of optimal financial contracts. Results of this paper are also important for policy makers, who want to ease bank lending standards.

*To Family and Friends*

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# Contents

# Chapter 1

# Do Patent Lawsuits Cause M&A? An Experiment Using Uncertain Lawsuits

## 1.1 Introduction

Competition in product markets gives rise to a new war arena: patent litigations. From 2010 to 2012, there was a twofold increase in the number of patent lawsuits filed in U.S. district courts[1]. This sharp increase was also accompanied by unprecedented damage awards. For example, in 2012, jury patent infringement awards three times exceeded one billion dollars. Excessive threat of litigation also shapes firm resource allocations. In 2011, for the first time, spending by Apple and Google on patent lawsuits and patent purchases exceeded spending on R&D of its new products. Despite its growing economic significance, causal effects of patent litigations on corporate policies has not been investigated, mainly because of the lack of appropriate empirical setting.

In this paper, I fill this void in the literature and investigate the causal effects of patent litigations on M&A activity. Specifically, I ask the following questions: Does losing in a patent litigation cause an alleged infringer to make particular type of acquisitions (i.e,

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[1]2714 patent infringement lawsuits filed in U.S. District courts in 2010 escalated to 5423 lawsuits in 2012.

focused vs. diversifying)? If it does, what are the explicit transmission mechanisms? I find that if the court finds a patent infringement, then the infringer sharply increases spending on focused acquisitions and decreases spending on diversifying acquisitions. Moreover, I also find that the infringer specifically conducts patent motivated acquisitions, in which it acquires targets that have alternative patents to the ones it was found infringing. Acquired alternative patents provide the infringer the opportunity to redesign its products or form a shield against future lawsuits. The litigation caused acquisitions explain a sizable portion of the overall M&A activity; a conservative calculation demonstrates that these results explain around 8% of all focused acquisitions and around 4% of all domestic M&A transactions.

The main challenge to testing these hypotheses is the endogeneity problem. Unobservable variables that drive a firm to win or lose a case may also drive the firm to make a particular type of acquisition. Therefore, a hypothetical experiment setup requires random assignment of alleged infringers to control and treatment samples. The control group should include alleged infringers who prevail in the case and are able to continue its production. Treatment group should include alleged infringers who lost the case and may need to stop producing infringing products. In this framework, the strength of the identification strategy relies on the degree that assignment to control and treatment groups is not correlated with unobservable variables of alleged infringers.

To solve this identification challenge, I propose a unique experimental setting that exploits the institutional details of the patent court system. In the U.S., a patent infringement claim is initiated in U.S. district courts. If any of the parties is not satisfied with district court decision, then it can appeal to the higher court, the Court of Appeals for the Federal Circuit

(CAFC). It is the only appellate court for patent cases and has federal jurisdiction. In CAFC, cases are heard by randomly assigned 3-judge panels. The decision is given by the majority rule and the judges in the panel can dissent by writing a dissenting opinion. For my experiment, I hand collect detailed data for all cases with a dissenting judge (i.e., decisions was given by 2 to 1) to assign alleged infringers to treatment and control groups. The dissenting judge cases are rare; they make less than 0.4% of patent lawsuit universe. Therefore, I argue that assignment of alleged infringer to experiment groups is close to random and my estimations establish a causal relation.

This identification strategy is also robust to many endogeneity concerns. First, due to the unique institutional structure, CAFC is the only appellate level court for patents and is located in Washington, DC. Therefore, my experiment is not subject to selection problem due to forum shopping. This unique structure for patent appellate court is different than for other types of litigations (e.g, bankruptcy) in which parties may select a court in a favorable location. Second, it may be argued that since writing a dissenting opinion may take a significant time, a judge would dissent less in the times of high case load. Such a situation may raise endogenity issues due to mismeasurement of the dissenting cases. However, my statistics show that there is no relation between caseload and number of dissents. Third, it may be possible that some judge may dissent less in some periods due to career concerns. However, this concern is minimal since all CAFC judges are appointed with life tenure. Fourth, it may be the case that parties may know CAFC decision due to judge's specific orientation. However, the evidences show that it is difficult to predict CAFC decisions beforehand. Allison and Lemley (2000) investigates whether CAFC judges are pro-patent or

anti-patent and they conclude that: "Judges do not fit easily into pro-patent or anti-patent categories, or into affirmers and reversers."

The patent motivated acquisition hypothesis is also backed by anecdotal evidences. For example, in 2012, Google acquired Motorola for $12.4 billion. In this transaction, Google paid $5.5 bil. for patents, $2.9 bil. for cash acquired and $4bil. for Motorola business and other assets. In a couple months after the acquisition, Google sold Motorola Home Business for $2.4 billion. Experts analyzing these transactions say that Google was never interested in Motorola business; what it wanted from the beginning was the Motorola's Android patents to protect itself against Apple's lawsuits[2]. This paper shows that Google example is not just an outlier; instead, patents are an important reason for acquisition decisions. Consistent with this argument, CRA International and K&L Gates North America senior executives survey finds that 72% of private equity respondents and 85% of corporate respondents agree that intellectual property (IP) portfolios are equally if not more important than other assets when evaluating a target (CRA and Gates (2008)).

The patent motivated acquisition channel brings a new complementary perspective to the existing literature. The previous literature documents that M&As occur for technology reasons (Betton and Thorburn (2008); Kaplan (2000) and synergies are the main drivers of these transactions (Andrade and Stafford (2001)). In the traditional view, Holmstrom and Roberts (1998) discuss that M&A may be conducted because of knowledge transfer. Complementary knowledge in the target can be used to foster innovation inside the company. Bena and Li (forth.) shows strong empirical evidence that synergies obtained from combining

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[2](i)"Google to Sell Motorola Home to Arris for $2.35 Billion", Bloomberg- Dec20, 2012.   (ii)"Google to Buy Motorola Mobility for $12.5 Billion", Wall Street Journal.

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innovation capabilities are important drivers of M&A activity. Patent acquisition channel is distinct from knowledge transfer channel in that companies may already have the knowledge for production but may only need legal protection against lawsuits.

How does need for legal protection create incentives for M&A? If an alleged infringer loses the case, it may get an injunction order, which requires it to stop producing products. In addition, the infringer may also need to pay high damage awards or royalty fees[3] (see Table 1.11). Besides these direct legal enforcement costs, diminished reputation in the product markets may yield the infringer to lose its prospective customers. Then, an infringement decision may lead the infringer to make two different, not mutually exclusive, types of acquisitions.

On the one hand, since the company may not able to produce its products, a diversifying acquisition may be optimal for the infringer to access some unrelated industries to find a new product (Matsusaka (2001)). On the other hand, an infringer may want to conduct focused M&A to obtain alternative patents to the ones it was found infringing. These alternative patents may bring important benefits. First, if the infringer can not get a license[4] from the patent holder or the license is not on reasonable terms, these acquired alternative patents may help the firm redesign its products and pursue its production. For example, Stratasys Ltd. states in SEC filings that[5]: "claims of intellectual property infringement successfully asserted against us may require us to redesign infringing technology...". Second,

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[3]35 U.S.C §284: "Upon finding for the claimant the court shall award the claimant damages adequate to compensate for the infringement, but in no event less than a reasonable royalty for the use made of the invention by the infringer, together with interest and costs as fixed by the court."

[4]Extreme Network Inc. 10-Q (May-2013): " an adverse court order or a settlement could require us, among other actions, to: obtain a royalty bearing license to sell or use the relevant technology, and that license may not be available on reasonable terms or available at all."

[5]Stratasys Ltd. 20-F (March-2013).

even though a company gets a license from the plaintiff, the court's finding of infringement increases the conditional probability that alternative patents of other companies are also infringed. Therefore, infringer may be required to get a license also from other alternative patent holders. Acquiring a patent portfolio, however, provides the opportunity to make counterclaims for the possible future plaintiffs. For example, in 2012, Facebook countersued Yahoo with patents acquired after being sued by Yahoo[6].

This paper has several contributions to the literature. First, in this paper, I propose a new motive for M&A activity: the patent acquisition channel. This channel is distinct from the traditional knowledge transfer channel. According to the traditional view, buying patent may not be feasible. After the value of an innovation established, most of the relevant information is disclosed and a potential buyer may have no incentive to acquire. However, I show that companies may already have the knowledge but only need legal protection against lawsuits. Therefore, patent motivated acquisition channel is an important complement to the previous literature.

Second, to my knowledge, this is the first paper to show a causal effect of how patent litigations effect M&A market. Especially, given the recent increase in number of patent litigations, my experiment shows that, in a conservative calculation, this channel explains at least 4% of all domestic M&A activity. This causal relation is important also for policymakers. In 2011, Congress passed the Leahy-Smith America Invents Act (AIA), which brought the most significant change to the U.S. patent system since 1952 (Matal (2012)). Moreover, some additional fundamental reforms to the U.S. patent law are still debated (White House

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[6] "Yahoo-Facebook: Brace for the countersuit", CNN Money, March 13, 2012.

(2013)). In the midst of these law changes, my results can help policymakers regarding possible effects of law changes on corporate finance decisions.

Third, this is the first paper to use dissenting judge decisions for identification strategy. Although I used the strategy for patent lawsuits, it can easily be generalized to other litigations such as antitrust, securities litigations, corporate governance and etc.

The remainder of this article is organized as follows. Section 1.2 provides an overview of institutional details of a patent litigation including patent enforcement and court structure. Section 1.3 describes the hand collected data and other data sources. Section 1.4 explains the main hypotheses. Section 1.5 discusses econometric methodology and results. Section 1.6 concludes and Appendix A.4 provides patent law glossary and other patent law related materials.

## 1.2   Institutional Background

### 1.2.1   What is A Patent?

A patent is a grant by the government, grounded in Article I, section 8, clause 8 of the U.S. Constitution, that gives the patent owner the exclusive right to make, use, offer for sale, sell, and import the invention described in the patent[7] for a specific term[8]. In essence, a patent represents a bargain between an inventor and society: in return for inventing something new and disclosing it to the world, the inventor gets the reward of a temporary monopoly over

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[7]35 U.S.C. §271(a)(2000).

[8]For applications filed on or after June 8, 1995, the patent term is 20 years from the filing date of the earliest U.S. application to which priority is claimed (excluding provisional applications). For applications filed before June 8, 1995 and for patents that were still in force on June 8, 1995, the patent term is either 17 years from the issue date or 20 years from the filing date of the earliest U.S. or international (PCT) application to which priority is claimed (excluding provisional applications), the longer term applying.

that invention. In order to qualify for a patent, however, an invention must be new, useful, and not obvious based on what a person skilled in the field of the invention knew at the time of the invention[9]. The inventor must also describe to persons skilled in the art how to use the invention, and must disclose the best mode known to her for using or "practicing" the invention[10].

## 1.2.2 Patent Enforcement

A patent holder who believes that someone else is making, using, selling, offering for sale, or importing a product or process that incorporates invention claimed in the patent, can sue an unauthorized party for infringement of the patent under 35 U.S.C. §281. The patentee typically seeks both money damages and an injunction[11], which stops an infringer producing infringing product, as well as awards of enhanced damages and attorneys' fees[12] because of willful infringement. In the patent litigation, accused infringers almost always defense themselves in 3 ways: i) they allege that the patent claims asserted against them are invalid for failure to comply with the patent laws, ii) their products are not infringing the underlying patent and iii) litigated patent is unenforceable because of the patentee's inequitable conduct in procuring the patent from the PTO by failing to comply with the duty of candor before the PTO (Federal Judicial Center, 2009). The details of these defenses can be found in Section A.1.

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[9] 35 U.S.C §102, 103.
[10] 35 U.S.C §112
[11] 35 U.S.C §283
[12] 35 U.S.C. §284 and 285

### 1.2.3 Patent Litigation

In this section, I will review the possible stages of a patent litigation after plaintiff filed the initial complaint. All patent infringement suits are initiated in US District Courts. If any of the parties is not satisfied with the court verdict, then it can appeal to the higher court, Court of Appeals For the Federal Circuit (CAFC). Depending on the CAFC decision, any of the parties can request Supreme Court to hear the case. However, the Supreme Court has discretionary review process which provides the court the authority to decide which appeals they will consider from among the cases submitted to them. The Supreme Court rejects to hear the case in more than 98% of all cases appealed to it[13], asserting that typically CAFC decision is final. From the year CAFC established, 1982, to 2012, the Supreme Court reviewed only 30 patent cases, making an average of 1 case/year. For this reason, CAFC is generally known as "Supreme Court of Patent Cases"[14].

#### 1.2.3.1 Lower Court: US District Courts

In the US, according to 28 U.S.C. §1331 & §1338, federal district courts have exclusive subject matter jurisdiction over patent infringement claims. Therefore, all patent infringement claims must be filed in federal district courts. Any federal district court in any jurisdiction may preside over the case, so long as the requirements of personal jurisdiction and venue are met. On this issue, the Federal Circuit has clarified that for corporate defendants, venue in a patent case generally exists wherever personal jurisdiction exists[15]. According to 28

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[13]http://www.uscourts.gov/educational-resources/get-informed/supreme-court/supreme-court-procedures.aspx

[14]Mark D. Janis, Patent Law in the Age of the Invisible Supreme Court, 2001 Univ. of Illinois Law Rev. 387, ("The Court of Appeals for the Federal Circuit . . . has become the de facto supreme court of patents")

[15]VE Holding Corp. v. Johnson Gas Appliance Co., 917 F.2d 1574, 1583-84 (Fed. Cir. 1990)

U.S.C. §1391(c), the personal jurisdiction requirement is met if defendants sell, offers to sell or license a product in the underlying forum. Since majority of the public companies sell their products in most of the states, practically forum shopping is quite common in district court level. Table1.17 shows the number of patent infringement claims initiated in each district court in 2005-2012 period.

### 1.2.3.2 Upper Court: Court of Appeals For the Federal Circuit (CAFC)

In 1975, the Hruska Commission[16] submitted its report (67 F.R.D. 195 [1975]) to Congress for making a reform that would allow to decrease the number of appeals in the US judical system. In this report, commissioners stressed a lack of uniformity in U.S. patent law across the geographical circuits and the resulting practice of forum shopping in patent cases. To address these problems, the Hruska Commission recommended that a national appeals court be established to handle patent litigations (67 F.R.D. at 371). Congress responded to these recommendations with the Federal Courts Improvement Act of 1982[17], which created the United States Court of Appeals for the Federal Circuit[18] under Article III of the Constitution as the sole U.S. appeals court in patent cases.

CAFC is unique among the thirteen U.S. Courts of Appeals because it is the only appellate court that has nationwide jurisdiction over certain subject matters[19], including patents.

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[16]Commission on Revision of the Federal Court Appellate System, Structure and Internal Procedures

[17](Pub. L. No. 164, 97th Cong., 2d Sess. [April 2, 1982])

[18]The Federal Courts Improvement Act of 1982 established two new courts: the United States Court of Appeals for the Federal Circuit (Federal Circuit) and the United States Court of Federal Claims while terminating two courts: the United States Court of Customs and Patent Appeals (CCPA) and the United States Court of Claims

[19]It has nationwide jurisdiction in a variety of subject areas, including international trade, government contracts, patents, trademarks, certain money claims against the United States government, federal personnel, veterans' benefits, and public safety officers' benefits claims. Appeals to the court come from all federal district courts, the United States Court of Federal Claims, the United States Court of International Trade, and the United States Court of Appeals for Veterans Claims. The court also takes appeals of certain

Moreover, since there is only one court, any party that is not satisfied with a district court judgement in a patent litigation should appeal the case to CAFC, which is located in Washington DC. This structure of CAFC eliminates forum shopping in appellate level for patent litigations since 1982. The authority of other courts of appeals, which have jurisdiction on other issues such as bankruptcy etc., however, is restricted by geographic location and thus there may be differing judicial standards depending on location.

The judges in CAFC are appointed by the President, with the advice and consent of the Senate. Once appointed, justices have life tenure unless they resign, retire, take senior status, or are removed after impeachment. In the court, twelve judges are appointed for active service. When eligible, judges may elect to take senior status, which permits them to continue to serve on the court while handling fewer cases than a judge in active service.

In CAFC, patent infringement appeals are heard by three judge panels, in which judges are randomly assigned among CAFC judges[20]. In a panel, verdict is given by the majority rule (i.e, agreement of 2 judges is sufficient to rise panel's judgment). If the one of the judges disagrees with the decision of majority opinion, then he or she can write a dissenting opinion, which neither creates a binding precedent nor does it become a part of case law. However, a dissenting opinion may be cited in future cases as a persuasive authority when arguing that the court's holding should be limited or overturned. If any of the judges in the panel agrees with the decision made by the majority of the court, but states different reasons as the basis for his or her decision, then he or she writes a concurring opinion. In the cases, when no

administrative agencies' decisions, including the United States Merit Systems Protection Board, the Boards of Contract Appeals, the Board of Patent Appeals and Interferences, and the Trademark Trial and Appeals Board. http://www.cafc.uscourts.gov/the-court/court-jurisdiction.html

[20]http://www.cafc.uscourts.gov/the-court/court-jurisdiction.html

absolute majority of the court can agree on the basis for deciding the case, the decision of the court may be contained in a number of concurring opinions, and the concurring opinion joined by the greatest number of judges is referred as the plurality opinion.

## 1.3   Hand Collected Dataset

### 1.3.1   Data Sources

In this paper, I used the following data sources: BloombergLaw, LexMachina, Harvard Patent Database, The KPSS patent data, CapitalIQ, Compustat, CRSP and SDC M&A. In the following sections, I will describe the details of each database and explain the filters used.

### 1.3.2   Hand Collection of Dissenting Judge Decisions

The main database that I used for court decisions is BloombergLaw, which offers access to primary legal content, court dockets, legal filings and reports from Bloomberg legal analysts. I create my initial sample by searching all U.S. CAFC Opinions from the founding year of CAFC, 1/1/1983, to 12/31/2011 with the keywords "dissent! and patent". This search returns 757 court opinions; 662 of these opinions are related with patent law and the rest is about other type of laws including civil procedure, trademark law, copyright law etc. 199 out of 658 cases are appeals raised from United States Patent and Trademark Office (USPTO) or International Trade Commission (ITC). Since my interest in this paper is only the appeals raised from U.S District Courts, I eliminate appeals from the other governmental offices. This filtering leaves me with 459 court opinions.

To include into my sample, I read each opinion whether it is a "dispositive" one, which means that as it leaves the Federal Circuit, at least one claim of one patent is finally adjudicated to have been infringed and not invalid or unenforceable (i.e., a win for the patent owner), or in which it has been finally determined that no claim has these characteristics (a win for the accused infringer). I include all dispositive decisions of the Federal Circuit, whether by precedential opinion, nonprecedential opinion, or per curiam affirmance without opinion under the court Rule 36. Then, I check the history of each case to make sure that this case was not appealed to the Supreme Court or reheard in an enbanc decision in a later stage. After excluding non-dissenting decisions and using these filters, I get 202 dispositive opinions, in which one of the judges have a dissenting opinion. In section 1.3.3, I give some examples of dispositive and non-dispositive decisions according to the this definition. In section 1.3.3.1, I provide an example for a dissenting judge decision.

## 1.3.3    Examples for Dispositive & Non-Dispositive Decisions

- **Non-Dispositive:** "Applied Medical Resources Corporation ("Applied") appeals from a decision of the United States District Court for the Central District of California granting summary judgment of non-infringement of United States Patent No. 5,385,553 ("the '553 patent") in favor of United States Surgical Corporation ("U.S.Surgical"). See Applied Med. Res. Corp. v. U.S. Surgical Corp., No. SA CV 03-1267 (C.D.Cal. Mar. 7, 2005) ("Applied Opinion"). Because we conclude that there are genuine issues of material fact regarding infringement of the '553 patent given the claim construction adopted by the district court, we vacate the district court's grant of summary judgment

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and remand for further proceedings consistent with this opinion."

- **Non-Dispositive:** "Cancer Research Technology Limited and Schering Corporation (collectively, "Cancer Research") appeal from the final decision of the United States District Court for the District of Delaware holding U.S. Patent 5, 260, 291 ("the '291 patent") unenforceable for prosecution laches and inequitable conduct. [**1938] Cancer Research Tech. v. Barr Labs., Inc., 679 F.Supp.2d 560 (D.Del. 2010). We reverse."

- **Dispositive:** "This appeal is from the judgment of the United States District Court for the Western District of Virginia, Danville Division (Turk, C.J.), in a patent infringement suit brought by Milliken Research Corporation against Dan River, Inc. for infringement of Milliken's U.S. Patents Nos. 3,254,510 and 3,277,673, to Lesley. The district court held both patents (the Lesley patents) invalid for obviousness under 35 U.S.C. Section 103. We affirm."

- **Dispositive:** "Teva Pharmaceuticals USA, Inc. ("Teva") appeals the final judgment of the United States District Court of Delaware, which, after a bench trial, found Merck & Co.'s ("Merck") U.S. Patent No. 5,994,329 (issued Nov. 30, 1999) ("the '329 patent") not invalid as anticipated or obvious. The district court further found the '329 patent to be enforceable, and the '329 patent claims 23 and 37 constructively infringed by Teva's Abbreviated New Drug Application ("ANDA") under 35 U.S.C. Section 271(e)(2)(A) of the Hatch-Waxman Act. Merck & Co., Inc. v. Teva Pharms. USA, Inc., 288 F.Supp.2d 601 (D.Del.2003) ("Merck"); Merck & Co., Inc. v. Teva Pharms. USA, Inc., No. 01-CV-0048, Order (D.Del. Sept. 24, 2003) (Final Judgment

Order Pursuant to Fed.R.Civ.P. 54(b) ) ("Final Judgment Order"). We disagree with the district court's construction of the claim term "about" in claims 23 and 37 of the '329 patent. Because we further hold claims 23 and 37 obvious in light of the prior art, we vacate the judgment of the district court and hold the claims invalid and not infringed."

### 1.3.3.1 An Example of A Dissenting Case in CAFC:

In this section, I will summarize an example of a patent lawsuit[21], in which one of the judges in the panel filed a dissenting opinion. In this case, General American Transportation Corp. ("GATC") sues Cryo-Trans, Inc. in the U.S. District Court for the Northern District of Illinois to declare that it does not infringe U.S. Patent 4,704,876 ('876). The district court judge Ruben Castillo, J. ruled that patents are valid, enforceable and GATC infringed the '876 patent. Having these findings, the judge entered a permanent injunction, prohibiting GATC using, selling, producing its alleged products and also held GATCH pay Cryo-Trans, Inc. $8,983,440 in damages.

After the District Court's finding of infringement, GATC appealed the case claiming that '876 patent is invalid and it did not infringe. In the appellate court, the Circuit judges Mayer, Lourie and Schall were randomly assigned to the case to investigate GATC claims. The judges Lourie and Schall ruled that patents are valid but GATC did not infringe the patent. In their majority opinion, they held that in claim construction phase the district court made an error, which caused an erroneous finding of infringement against GATC. Given that a patent infringement enforcement requires both patent validity and infringement,

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[21]General American Transportation Corp. v. Cryo-Trans, Inc., 93 F.3d 766.

Lourie and Schall judgement reverses the district court ruling and find that GATC can not be hold liable for patent infringement. As a consequence, permanent injunction entered against GATC will be reversed, giving GATC its right back for using, selling, producing of its alleged products. Moreover, after CAFC finding, GATC is also relieved from paying Cryo-Trans, Inc. $8,983,440 in damages.

Mayer, the other circuit judge in the panel, however, did not agree with Lourie and Schall findings. In his dissenting opinion, Mayer discussed that the district court correctly construed the claim limitation and it also correctly held that GATC infringed the '876 patent. In the below, I provide quotes of this dissenting opinion as well as the majority opinion from the original court document.

**Parties:** General American Transportation Corp. (Plaintiff-Appellant) & Cryo-Trans, Inc. (Defendant-Appellee).

**Rehearing Availability:** Rehearing Denied; Suggestion for Rehearing In Banc Declined.

**Judges in the Panel:** MAYER, LOURIE, and SCHALL, Circuit Judges.

**Result:** Judgment Affirmed (In Part), Judgment Reversed (In Part)

**Summary:** "General American Transportation Corp. ("GATC") appeals from the judgment of the United States District Court for the Northern District of Illinois in which the court held GATC liable for patent infringement, awarded Cryo-Trans, Inc. $8,983,440 in damages, and entered a permanent injunction against GATC. General Am. Transp. Corp. v. Cryo-Trans, Inc., 897 F.Supp. 1121 (N.D.Ill.1995); General Am. Transp. Corp. v.

Cryo-Trans, Inc., 893 F.Supp. 774 (N.D.Ill.1995). Because the court correctly held that the patent was not proved invalid, but misconstrued the claims and clearly erred in finding infringement, we affirm in part and reverse in part."

**Conclusion:** "The district court erred as a matter of law in construing the claims and clearly erred in finding infringement. Accordingly, the court's decision finding infringement, awarding damages, and entering a permanent injunction is reversed. Its conclusion concerning validity is affirmed."

**Majority Opinion:** LOURIE, Circuit Judge, writes the majority opinion and SCHALL, Circuit Judge, joins.

"...GATC argues that the district court misconstrued the claim language "openings through said ceiling means adjacent to each of said side walls and end walls," which led to a clearly erroneous finding of infringement. We agree. As explained below, the district court incorrectly held that openings "adjacent" to the side walls could also be considered to be openings "adjacent" to the end walls. *That error led to a clearly erroneous finding of infringement.* To ascertain the meaning of the claims, we consider the claim language, the specification, and the prosecution history. Markman, 52 F.3d at 979, 34 USPQ2d at 1329. Here, the claim language itself distinguishes between the openings that are adjacent to the side walls and those that are adjacent to the end walls. Specifically, the claims require "openings ... adjacent each of said side walls and end walls," which suggests that the openings adjacent to the side walls are structurally distinct from the openings adjacent to the end walls. The

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district court's claim construction obliterated that distinction..."

**Dissenting Opinion:** MAYER, Circuit Judge, dissenting.

"*The district court correctly construed the only claim limitation in dispute*: "[T]he term 'adjacent' as used in the '876 patent means 'not far off.' " The court then found that the openings nearest the end walls of General American Transportation Corporation's (GATC) accused railcar were "adjacent" to those walls and therefore literally infringed the claim. *I see no error in claim construction or in the finding of infringement....*"

## 1.4   Hypotheses Development

### 1.4.1   *Hypothesis 1: Does an alleged infringer increase focused (diversified) acquisitions after losing the lawsuit?*

Why does the outcome of an infringement lawsuit drive a firm to make a focused or diversifed acquisition? The main rational for this hypothesis is that if an alleged infringer loses the case, it may get an injunction order, which requires it to stop producing products. In addition, the infringer may also need to pay high damage awards or royalty fees[22] (see Table 1.11). Besides these direct legal enforcement costs, diminished reputation in the product markets may yield the infringer to lose its prospective customers. Then, an infringement decision may lead the infringer to make two different, not mutually exclusive, types of acquisitions. On the one hand, since the company may not able to produce its products, a diversifying acquisition may be optimal for the infringer to access some unrelated industries to find a new

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[22]35 U.S.C §284: "Upon finding for the claimant the court shall award the claimant damages adequate to compensate for the infringement, but in no event less than a reasonable royalty for the use made of the invention by the infringer, together with interest and costs as fixed by the court."

product. On the other hand, an infringer may want to conduct focused M&A to increase its market power or obtain alternative patents to the ones it was found infringing. Making both diversifying and focused acquisitions simultaneously may not be optimal since excessive acquisition may distract company management in its existing projects.

### 1.4.2 *Hypothesis2: Does possible target's having alternative patents increase chance to be acquired?*

In this hypothesis, I test whether court's finding of infringement induce companies to make patent motivated acquisitions, in which targets have alternative technology patents. The main rational for this hypothesis is that after finding of infringement, companies may need to stop producing the infringing products or redesign them by acquiring alternative technology patents. These alternative patents may bring important benefits. First, if the infringer can not get a license[23] from the patent holder or the license is not on reasonable terms, companies may choose to obtain similar technology patents. For example, QIWI states in SEC filings[24] that : "if we cannot or do not license the infringed technology on reasonable terms or substitute similar technology from another source, our revenue and earnings could be adversely impacted". These acquired alternative patents may help the firm redesign its products and pursue its production. For example, Stratasys Ltd. states in SEC filings that[25]: "claims of intellectual property infringement successfully asserted against us may require us to redesign infringing technology...".

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[23]Extreme Network Inc. 10-Q (May-2013): " an adverse court order or a settlement could require us, among other actions, to: obtain a royalty bearing license to sell or use the relevant technology, and that license may not be available on reasonable terms or available at all."

[24]QIWI Form 424B4 filed on May 03, 2013

[25]Stratasys Ltd. 20-F (March-2013).

Second, acquiring a patent provides an important benefit that licensing from plaintiff or other patent holders does not. A license, is only a promise by the patent owner (the licensor) not to sue the licensee for exercising one of the patent owner's rights. However, due to uncertainty in claim construction explained in section A.1.2, the court's finding of infringement increases the conditional probability that alternative patents of other companies are also infringed. Therefore, infringer may be required to get a license also from each of the other alternative patent holders. Acquiring a patent portfolio, however, provides the opportunity to make counterclaims for the possible future plaintiffs. For example, in 2012, Facebook countersued Yahoo with patents acquired after being sued by Yahoo[26].

## 1.5 Empirical Section

In this section, first I will explain the data collection process for matching alleged infringer names to Compustat database. Then, I will provide the rational for hypotheses and their empirical tests.

### 1.5.1 Collecting Alleged Infringer Information & Summary Statistics

The main problem is in matching alleged infringers to Compustat database is that there is no identifier for the parties in the court documents. Simple name matching is also problematic: sometimes companies use very different abbreviations for their names. In addition, some of the companies change their names at some point in time and, more problematically, some unrelated companies gather these names. Therefore, even a good name matching algorithm

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[26] "Yahoo-Facebook: Brace for the countersuit", CNN Money, March 13, 2012.

that would take into account misspelling and abbreviations may match alleged infringers to unrelated companies.

To overcome these problems, specifically, I hand-match the alleged infringers names with the S&P CapitalIQ. This database has several benefits: first, it assigns each company a unique identifier and tracks all the previous names; second, it provides basic business description for each company. Therefore, I start my data construction by searching CapitalIQ for all companies that used the underlying alleged infringer name at some point in time. In some cases, I get different companies that are operating in very different industries but used the same or similar name in their life cycle. To find the appropriate match, I read the descriptions of patents in the lawsuit and business description of the companies to make sure that I correctly match. I also double check from LexMechina database if there exists any court document that has ownership document about the parties.

After matching alleged infringer names with S&P CapitalIQ unique identifiers, I drop companies that have another case decision in the 2 year interval. This filtering provides me to directly see unconfounded effect of each litigation. Then, to be able to match my sample with other standard databases, I use CapitalIQ-Gvkey identifier information in WRDS to get gvkey for each company at the time of the court decision. After getting gvkey for each of the firms, my sample has 63 public companies in the treatment sample (losers) and 48 companies in the control sample (winner). Table2.1 shows the summary statistics for the resulting sample. In treatment group, companies have an average assets value of $20.18 bil, while companies in the control group have $19.75 bil. Both groups also have similar capital structure ratios: capital expenditure/asset, leverage and cash ratio are 0.13, 0.238

and 0.09 in treatment group while control group has 0.15, 0.224 and 0.116, respectively. The last column in Table2.1 show the t-statistics for the difference of each of these ratios. Each difference is insignificant; therefore, control and treatment samples are appropriate for hypothesis testing.

## 1.5.2 Pre-Hypothesis Testing: Examining Parallel Trends Assumption

To make an inference in treatment-effects framework, control and treatment samples should behave similarly in the period prior to the treatment event (the parallel trends assumption). To test for parallel trends, I compare pre-existing changes and levels of my outcome variables across firms in the control and treatment groups. Specifically, I regress levels at time (t-1) and changes in the outcome variables from time (t-1) to (t-2) to treatment dummy and firm control variables. Finding a significant coefficient in treatment dummy would mean that the necessary condition is violated. Table1.3 shows the regression results; there is no significant pre-existing differences in either changes or levels of the outcome variables, which are quarterly spending on focused and diversifying acquisitions both scaled by assets. Therefore, in my sample, parallel trends condition is not violated.

## 1.5.3 Hypothesis Testing

### 1.5.3.1 *Testing Hypothesis 1: Does an alleged infringer increase focused (diversified) acquisitions after losing the lawsuit?*

To test hypothesis, first I gather all completed domestic M&As available on SDC's U.S. Mergers and Acquisitions Database between 1983-2012 period. I limit my analysis to transactions with an explicit change of control: The acquirer must purchase 50% or more of the target's

shares in the transaction and own less than 50% of the target prior to the transaction. For each target and acquirer, I gather primary 4-digit SIC code of the company.

For the experimenal setup, I use difference-in-difference (DID) and fixed effects regressions in 4 quarters interval of court announcement date for each alleged infringer. In DID specification shown in Equation(1.1), the dependant variable refers to the amount that alleged infringer $i$ spent on focused acquisition scaled by its total assets in the quarter $t$. As in Bena and Li (forth.) and Arikan and Stulz (2011), I define acquisitions in which acquirer and target are in the same 2-digit SIC code as focused acquisition (i.e, related) and define others as diversifying acquisitions. In this specification, $Loser_i$ is a binary variable that takes a value of 1 if alleged infringer lost the case (i.e, found infringing) and takes 0 if it won (i.e, prevailed). $After_t$ is a binary variable denoting whether the underlying quarter is after the court announcement date. $After_t \times Loser_i$ is interaction of $After$ and $Loser$. $\gamma_T$ is a year fixed effect and $X_{i,t}$ is quarterly control variables including lagged cash, lagged leverage, R&D, book-to-market (B/M), capital expenditures, return on assets (ROA), return on equity (ROE) and logarithm of assets.

$$\frac{Focused\_Acq\_Amount_{i,t}}{Total\_Assets_{i,t}} = \lambda(After_t \times Loser_i) + \beta(After_t) + \delta(Loser_i) + \varphi X_{i,t} + \gamma_T + \varepsilon_{i,t} \quad (1.1)$$

$$\frac{Diversifying\_Acq\_Amount_{i,t}}{Total\_Assets_{i,t}} = \lambda(After_t \times Loser_i) + \beta(After_t) + \delta(Loser_i) + \varphi X_{i,t} + \gamma_T + \varepsilon_{i,t}$$

$$(1.2)$$

Table 1.4 shows the regression results of Equation (1.1). The interaction term $After_t \times Loser_i$ is statistically significant at 5% level. This result shows that if the court gives an infringement decision, then the infringer increases spending on focused M&A by 0.6% of its total assets in the subsequent year. In 2012, the total assets of the companies that lost a case in CAFC was more than $ 4tril. Therefore, patent litigations induced firms to increase its focused acquisitions by $24 bil./year. In 2012, domestic focused acquisitions was $294bil. and total domestic M&A activity was $585 bil. According to these statistics, even in this conservative estimation, patent infringement explain around 8.1% of focused M&A and 4.1% of all domestic M&A activity.

Next, I investigate whether losing a case has any effect on diversifying acquisitions. For infringers, a diversifying acquisition may be optimal since it may provide to access some unrelated industries to find a new product. However, given the exogenous increase in focused acquisitions (Table 1.4), infringers may choose to decrease diversifying acquisitions. Table 1.5 shows the regression results of equation (1.2), which is same as equation (1.1) except the dependant variable gauges the ratio of diversifying acquisitions instead of the ratio of focused acquisitions over assets. I find that after finding of infringement, companies decrease diversifying M&A by 0.24% in the subsequent year. Therefore, my overall results in DID specifications show that after finding of infringement, companies increase focused acquisitions and decrease diversifying acquisitions.

$$\frac{Focus\_Acq\_Amount_{i,t}}{Total\_Assets_{i,t}} = \beta(After_t) + \varphi X_{i,t} + \gamma_T + \alpha_i + \varepsilon_{i,t} \tag{1.3}$$

Given that DID specification does not allow to use firm fixed effects due to multicollinearity, as a robustness test, I run fixed effect regressions for loser and winners separately as in equation (1.3). This specification helps to control time-invariant unobservable characteristics of each company and shows the effect of the court decision. One problem with fixed effect regression is that it does not capture time-varying unobservable variables. However, since analysis is conducted in 4 quarter interval of court decision date, the concern is minimal in this experimental setup. In equation (1.3), $After_t$ is a binary variable denoting whether the underlying quarter is after the court announcement date, $\alpha_i$ is the firm fixed effects and and $X_{i,t}$ is quarterly control variables including lagged cash, leverage, R&D, Book to Market (B/M), Capital Expenditures, return on assets (ROA), return on equity (ROE) and logarithm of assets. Table 1.6 and Table 1.7 shows the regression results of Eqn. (1.3) for losers and winners, respectively. The results are consistent with DID results. Table 1.6 shows that there is an increase in focused acquisition for losers. However, there is insignificant negative effect for winners as demonstrated in Table 1.7.

### 1.5.3.2 *Testing Hypothesis2: Does possible target's having alternative patents increase chance to be acquired?*

To test the hypothesis, I use conditional logit regressions as in equation (1.4). In this specification, for each acquirer- actual target pair, I create three acquirer-control target pairs. Control targets are propensity score matches of actual target by size and B/M for the same 4-digit SIC industries and year. Similar to data collection process employed in section 1.5.3.1, I gather all completed domestic M&As available on SDC's U.S. Mergers and Acquisitions Database between 1983-2012 period. I limit my analysis to transactions with

an explicit change of control: The acquirer must purchase 50% or more of the target's shares in the transaction and own less than 50% of the target prior to the transaction.

$$Acquirer-Target_{ijm,t} = \alpha + \beta_1 Alternative\_Patent + \beta_2 Tech\_Overlap + \beta_3 X_{i,t} + \beta_4 Y_{j,t} + \gamma_m + \varepsilon_{ijm,t}$$

$$(1.4)$$

In equation (1.4), $Acquirer-Target_{ijm,t}$ takes the value of 1 if firm $j$ is an actual target of acquirer $i$ in deal $m$. It takes the value of zero if firm $j$ is a matched target. $\gamma_m$ is deal fixed effect. In this specification, $Tech\_Overlap$ refers to different patent based measures to gauge research similarity among two firm. These measures are defined in Bena and Li (forth.); and I explain in section A.3.2. To derive patent-based measures, it is standard to use NBER Patent Database. However, this dataset has coverage for public company patents only from 1976 to 2006. Therefore, in this paper, I use two complementary databases that have coverage until 2010: KPSS Patent Database and Harvard Patent Database. KPSS, which was introduced in Kogan and Stoffman (2012), covers all patents granted between 1926 and 2010 and has information about unique patent number granted by USPTO and CRSP unique identifier permno. I use gvkey-permno linking table in WRDS to associate patents to companies and extract firm level information from Compustat database. Next, using the unique USPTO patent numbers, I merge all patents with Harvard Patent Database, which has detailed information about citing patents, patent main classes and patent subclasses.

After this merge operation, for each infringer, I identify the *Alternative_Patent*. I define a patent an alternative if two patents are in the same main classification and also in the same for half of subclassifications.

For the experiment, I use M&A transactions of alleged infringers in the subsequent year to court announcement date. Since patent databases cover only public companies, I restrict my sample to public company targets. Table 1.9 presents the estimates of conditional logit regressions. The variable of interest in this table is the *Alternative_Patent*. Panel A shows the coefficient estimates for alleged infringers for losers and Panel B shows the estimates for winners. The Panel A coefficient estimates for *Alternative_Patent* in Column(I) is statistically significant at 1% level. This result shows that target's having an alternative patent increases its chance to be acquired by an acquirer who has recently lost in a lawsuit. In Panel A, I also control for different *Tech_Overlap* measures that may provide synergy for the acquisition. My results are consistent with Bena and Li (forth.); technology overlap between acquirer and target increase the likelihood of acquisition. In these regressions, estimated coefficient of alternative patent measure is also significant and fosters the argument that accessing alternative patent is an important reason for acquisition for losers.

As a robustness test, I make the same analysis in Panel A for the alleged infringers who prevailed in the case. Given that these companies do not infringe a patent and has the right to pursue production, I do not expect these companies to conduct M&A for accessing alternative patents. Panel B in Table 1.9 shows the results: consistent with my hypothesis, coefficient estimate of *Alternative_Patent* is insignificant and different technology overlap measures are statistically significant in 1% and 10% levels.

### 1.5.3.3 *Is there market reaction differences in focused vs diversifying M&A for winners vs. losers?*

This hypothesis investigates whether there exists difference in market reaction to focused and diversifying M&A that were conducted after the court announcement. To test this hypothesis, I use the regression equation in (1.5). In this specification, $Focused_{i,j}$ is a dummy variable indicating whether the transaction $j$ of the acquirer $i$ is a focused acquisition. I define acquisitions in which acquirer and target are in the same 2-digit SIC code as focused acquisition (i.e, related) and define others as diversifying acquisitions. $Loser_i$ is a binary variable that takes a value of 1 if alleged infringer is in the treatment group (i.e, found infringing) and takes 0 if an alleged infringer is in the control group (i.e, prevailed in the case). $Focused_{i,j} \times Loser_i$ is the interaction term calculated by multiplication of loser dummy and focused dummy. $Z_{i,j}$ refers to M&A control variables consisting of transaction value (in \$mil), target public status dummy, all cash dummy, acquirer market capitalization and relative size (transaction value divided by the equity market capitalization of the acquirer at the end of the fiscal year prior to the acquisition announcement).

$$AbnormalReturn_{i,j} = \beta_0 + \beta_1(Focused_{i,j} \times Loser_i) + \beta_2 Focused_{i,j} + \beta_3 Loser_i + \beta_4 Z_{i,j} + \varepsilon_{i,j}$$

$$(1.5)$$

To calculate abnormal returns, I use three different approaches: value-weighted, equal-weighted and market model. In value-weighted (equal-weighted) approach, the abnormal returns results after subtracting the return of the CRSP value-weighted (equal-weighted)

from market index from day t = -1 to day t= +1 where t = 0 is the acquisition announcement date. In the market model, the abnormal return is calculated by subtracting return from market-based estimate. The parameters for the market model are estimated over the (-205, -6) interval.

I eliminate transactions that has value less than \$1mil. or size of the transaction is less than 1% of equity market capitalization of the acquirer at the end of the fiscal year prior to the acquisition announcement. In Eqn.(1.5), our variable of interest is the coefficient estimate of the interaction term, $Focused_{i,j} \times Loser_i$. Table 1.10 shows the results: the coefficient of interaction term in value-weighted model is %0.26 and statistically significant at 1% level. These results demonstrate that after court's finding of infringement, the effort of infringers for accessing alternative technologies is valued by the financial markets.

## 1.6    Conclusion

In this paper, I investigate the causal effects of patent litigations on M&A activity. Specifically, I ask the following questions: Does losing in a patent litigation cause an alleged infringer to make particular type of acquisitions (i.e, focused vs. diversifying)? If it does, what are the explicit transmission mechanisms? I find that if the court finds a patent infringement, then the infringer sharply increases spending on focused acquisitions and decrease spending on diversifying acquisitions. Moreover, I also find that the infringer specifically conducts patent motivated acquisitions, in which it acquires targets that have alternative patents to the ones it was found infringing. Acquired alternative patents provide the infringer the opportunity to redesign its products or form a shield against future lawsuits. The litigation caused ac-

quisitions explain a sizable portion of the overall M&A activity; a conservative calculation demonstrates that these results explain around 8% of all focused acquisitions and around 4% of all domestic M&A transactions.

For identification strategy, I propose a unique experimental setting that exploits the institutional details of the patent court system. In U.S., a patent infringement claim is initiated in U.S. district courts. If any of the parties is not satisfied with district court decision, then it can appeal to the higher court, the Court of Appeals for the Federal Circuit (CAFC). It is the only appellate court for patent cases and has federal jurisdiction. In CAFC, cases are heard by randomly assigned 3-judge panels. The decision is given by the majority rule and the judges in the panel can dissent by writing a dissenting opinion. For my experiment, I hand collect detailed data for all cases with a dissenting judge (i.e., decisions was given by 2 to 1) to assign alleged infringers to treatment and control groups. The dissenting judge cases are rare; they make less than 0.4% of patent lawsuit universe. Therefore, I argue that assignment of alleged infringer to experiment groups is close to random and my estimations establish a causal relation.

This paper has several contributions to the literature. First, in this paper, I propose a new motive for M&A activity: the patent acquisition channel. This channel is distinct from the traditional knowledge transfer channel. According to the traditional view, buying patent may not be feasible. After the value of an innovation established, most of the relevant information is disclosed and a potential buyer may have no incentive to acquire. However, I show that companies may already have the knowledge but only need legal protection against lawsuits. Therefore, patent motivated acquisition channel is an important complement to

the previous literature.

Second, to my knowledge, this is the first paper to show a causal effect of how patent litigations effect M&A market. Especially, given the recent increase in number of patent litigations, my experiment shows that, in a conservative calculation, this channel explains at least 4% of all domestic M&A activity. This causal relation is important also for policymakers. In 2011, Congress passed the Leahy-Smith America Invents Act (AIA), which brought the most significant change to the U.S. patent system since 1952 (Matal (2012)). Moreover, some additional fundamental reforms to the U.S. patent law are still debated (White House (2013)). In the midst of these law changes, my results can help policymakers regarding possible effects of law changes on corporate finance decisions.

Third, this is the first paper to use dissenting judge decisions for identification strategy. Although I used the strategy for patent lawsuits, it can easily be generalized to other litigations such as antitrust, securities litigations, corporate governance and etc.

# 1.7   Tables

<div align="center">

**Table 1.1:**
**Summary Statistics**
</div>

This table presents the summary statistics for the Control and Treatment groups used in this study. Control group consist of alleged infringers who prevailed in a dispositive decision in CAFC during 1983-2011 period. Treatment group consist of alleged infringers who was found infringing at least a patent in a dispositive opinion in the same period. Similar to Janicke (2006), I define a case dispositive if it satisfies the following conditions: i) as it leaves the Federal Circuit, at least one claim of one patent is finally adjudicated to have been infringed and not invalid or unenforceable (i.e., a win for the patent owner); ii) it has been finally determined that no claim has these characteristics (a win for the accused infringer). I include all dispositive decisions of the Federal Circuit, whether by precedential opinion, nonprecedential opinion, or per curiam affirmance without opinion under the courts Rule 36. Definitions of the variables are provided in the Appendix A.3.

| | **Treatment** | | | **Control** | | | **Difference (t-stat)** |
|---|---|---|---|---|---|---|---|
| | Mean | Median | Std. | Mean | Median | Std. | |
| Assets($bil) | 20.18 | 16.00 | 19.06 | 19.75 | 13.34 | 19.64 | (0.76) |
| Leverage | .238 | .223 | .238 | .224 | .245 | .120 | (0.75) |
| Cash Ratio | .093Â | .081 | .080 | .116 | 081 | .103 | (-0.92) |
| Book-to-Market | .389 | .329 | .369 | .346 | .328 | .208 | (0.67) |
| R&D Ratio | .079 | .072 | .048 | .089 | .079 | .065 | (-0.95) |
| ROA | .015 | .017 | .022 | .012 | .013 | .025 | (0.64) |
| ROE | .039 | .043 | .035 | .038 | .040 | .062 | (0.01) |
| Number of Firms | 63 | | | 48 | | | |

**Table 1.2:**
**Summary Statistics- Actual vs. Matched Targets**

This table reports summary statistics of the target firms specified in Eqn 1.4. Actual target refers to acquisitions of alleged infringers in the subsequent 3 year to court announcement date. Control targets are propensity score matches of actual target by size and B/M for the same 4-digit SIC industries and year. The variable descriptions are as follows: Assets = ATQ. Book Leverage = Total Debt / Book Assets = (DLCQ+DLTTQ) / ATQ. Cash = Cash / Book Assets = CHEQ / ATQ. R&D = Research and development expenses (XRDQ) / lagged total assets(ATQ). Return on Assets (ROA) = Operating income before depreciation (OIBDPQ) / lagged total assets (ATQ). Return on Equity (ROE) =Income before extraordinary items/one-quarter-lagged book equity= IBQ/SEQQ.

| | **Actual** | | | | **Control** | | | |
|---|---|---|---|---|---|---|---|---|
| | N | Mean | Median | Std. | N | Mean | Median | Std. |
| Assets($mil) | 100 | 3260.17 | 202.24 | 8674.25 | 300 | 3115.98 | 168.70 | 8764.59 |
| Leverage | 97 | .231 | .086 | .436 | 289 | .226 | .158 | .296 |
| Cash Ratio | 100 | .333Â | .267 | .281 | 296 | .258 | .144 | .277 |
| Book-to-Market | 100 | .505 | .392 | 1.46 | 200 | .504 | .393 | 1.12 |
| R&D Ratio | 77 | .048 | .028 | .091 | 185 | .044 | .025 | .056 |
| ROA | 99 | .003 | .007 | .109 | 286 | .002 | .005 | .121 |
| ROE | 99 | .003 | .019 | .212 | 286 | .005 | .015 | 1.61 |

**Table 1.3:**
**Pre-Existing differences in outcome variables for treatment and control groups.**

This table reports results on pre-existing differences in outcome variables for treatment (loser) and control (winner) groups. Panel A reports results on differences in pre-existing changes ("trends") in these variables, and Panel B reports results on differences in levels. The first and second columns reports results for amount spent for focused and diversified acquisition scaled by assets. I define acquisitions in which acquirer and target are in the same 2-digit SIC code as focused acquisition and define others as diversifying acquisitions. In the regression t=0 refers to the court announcement quarter and t=-1 is the quarter before the court announcement date. $Loser_i$ is a binary variable that takes a value of 1 if alleged infringer is in the treatment group (i.e, found infringing) and takes 0 if an alleged infringer is in the control group (i.e, prevailed in the case). In each regression, I control company characteristics summarized in Table2.1. T-statistics shown in parenthesis and *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels respectively.

| Dependant Variable: | Focused Acq./Asset | Diversifying Acq./Asset |
|---|---|---|
| | (I) | (II) |
| **PANEL A: Changes (t-2 to t-1)** | | |
| Loser | 0.016 | -0.061 |
| | (0.38) | (-0.46) |
| Company Controls | Yes | Yes |
| $R^2$ | 4.3% | 2.1% |
| N | 94 | 94 |
| **PANEL B: Levels (t-1)** | | |
| Loser | 0.050 | -0.01 |
| | (0.15) | (-0.27) |
| Company Controls | Yes | Yes |
| $R^2$ | 5.3% | 4.1% |
| N | 94 | 94 |

**Table 1.4:**
**Do Losers Make More Focused Acquisitions? (Diff-in-Diff)**

This table presents results illustrating the relationship between outcome of a patent litigation and alleged infringer's focused M&A activity in 4 quarters interval of the court announcement date. The exact specification is defined in Eq.(1.1). In this DID regression, the coefficient estimates shows the estimates of the average change in focused acquisitions for control(winner) and treatment (loser) groups. The dependant variable refers to the ratio of amount that alleged infringer spent on focused acquisition scaled to the firm's total assets. I define acquisitions in which acquirer and target are in the same 2-digit SIC code as focused acquisition and define others as diversifying acquisitions. In this specification, $Loser_i$ is a binary variable that takes a value of 1 if alleged infringer is in the treatment group (i.e, found infringing) and takes 0 if an alleged infringer is in the control group (i.e, prevailed in the case). Control group consist of all alleged infringers who prevailed in a dispositive decision in CAFC during 1983-2011 period. Treatment group consist of alleged infringers who was found infringing at least a patent in a dispositive opinion in the same period. Similar to Janicke (2006), I define a case dispositive if it satisfies the following conditions: i) as it leaves the Federal Circuit, at least one claim of one patent is finally adjudicated to have been infringed and not invalid or unenforceable (i.e., a win for the patent owner); ii) it has been finally determined that no claim has these characteristics (a win for the accused infringer). I include all dispositive decisions of the Federal Circuit, whether by precedential opinion, nonprecedential opinion, or per curiam affirmance without opinion under the courts Rule 36. $After_t$ is a binary variable denoting whether the underlying quarter is after the court announcement date. Definitions of the variables are provided in the Appendix A.3. Robust standard errors are reported in parentheses; *, **, and *** denote significance at the 10%, 5% and 1% level.

| | Dependent Variable: Focused Acquisition Amount/Assets (in percentages) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| VARIABLES | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| $Loser \times After$ | 0.150** | 0.087** | 0.103** | 0.105** | 0.104** | 0.103** | 0.089** | 0.106** |
| | (2.12) | (2.15) | (2.08) | (2.20) | (2.10) | (2.09) | (2.31) | (2.16) |
| Loser | -0.013 | -0.017 | -0.008 | -0.017 | -0.014 | -0.013 | -0.003 | -0.015 |
| | (-0.36) | (-0.61) | (-0.22) | (-0.49) | (-0.39) | (-0.36) | (-0.11) | (-0.44) |
| After | -0.023 | -0.013 | -0.025 | -0.023 | -0.022 | -0.022 | -0.021 | -0.023 |
| | (-0.74) | (-0.51) | (-0.81) | (-0.78) | (-0.72) | (-0.72) | (-0.89) | (-0.76) |
| $R\&D$ | 0.466** | | 0.332 | 0.407* | 0.428* | 0.467** | 0.380** | 0.415** |
| | (2.08) | | (1.57) | (1.88) | (1.94) | (2.09) | (2.31) | (2.13) |
| Sales/Assets | 0.257* | 0.187* | | 0.217 | 0.252* | 0.243* | 0.235** | 0.260* |
| | (1.79) | (1.84) | | (1.57) | (1.75) | (1.70) | (1.98) | (1.90) |
| Capex/Assets | -1.236 | -1.011 | -1.051 | | -1.237 | -1.225 | -1.044* | -1.188 |
| | (-1.61) | (-1.55) | (-1.38) | | (-1.61) | (-1.60) | (-1.69) | (-1.56) |
| ROA | 0.754 | 0.703 | 0.697 | 0.767 | | 0.277 | 0.555 | 0.588 |
| | (0.94) | (1.15) | (0.87) | (0.97) | | (0.47) | (1.21) | (0.79) |
| ROE | -0.263 | -0.171 | -0.204 | -0.264 | -0.077 | | -0.052 | -0.244 |
| | (-0.89) | (-0.79) | (-0.69) | (-0.93) | (-0.35) | | (-0.30) | (-0.83) |
| B/M | -0.077 | -0.057 | -0.086* | -0.073 | -0.082* | -0.067 | | -0.072 |
| | (-1.59) | (-1.52) | (-1.78) | (-1.61) | (-1.71) | (-1.43) | | (-1.52) |
| Log(Assets) | -0.002 | -0.004 | -0.006 | -0.001 | -0.001 | -0.002 | -0.002 | |
| | (-0.33) | (-0.73) | (-0.86) | (-0.15) | (-0.19) | (-0.34) | (-0.46) | |
| Cash/Assets | -0.055 | 0.064 | -0.045 | -0.028 | -0.017 | -0.043 | -0.014 | |
| | (-0.46) | (0.70) | (-0.38) | (-0.24) | (-0.16) | (-0.36) | (-0.17) | |
| N | 387 | 571 | 387 | 401 | 387 | 387 | 505 | 389 |
| $AdjR^2$ | 0.026 | 0.023 | 0.021 | 0.023 | 0.027 | 0.027 | 0.023 | 0.030 |
| Year Dummies | YES | YES | YES | YES | YES | YES | YES | YES |
| Firm Fixed Effects | NO | NO | NO | NO | NO | NO | NO | NO |

t-statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%.

## Table 1.5:
## Do Losers Make More Diversifying Acquisitions? (Diff-in-Diff)

This table presents results illustrating the relationship between outcome of a patent litigation and alleged infringer's diversifying M&A activity in 4 quarters interval of the court announcement date. The exact specification is defined in Eq.(1.2). In this DID regression, the coefficient estimates shows the estimates of the average change in diversifying acquisitions for control(winner) and treatment (loser) groups. The dependant variable refers to the ratio of amount that alleged infringer spent on diversifying acquisition scaled to the firm's total assets. I define acquisitions in which acquirer and target are not in the same 2-digit SIC code as diversifying acquisitions. In this specification, $Loser_i$ is a binary variable that takes a value of 1 if alleged infringer is in the treatment group (i.e, found infringing) and takes 0 if an alleged infringer is in the control group (i.e, prevailed in the case). Control group consist of all alleged infringers who prevailed in a dispositive decision in CAFC during 1983-2011 period. Treatment group consist of alleged infringers who was found infringing at least a patent in a dispositive opinion in the same period. Similar to Janicke (2006), I define a case dispositive if it satisfies the following conditions: i) as it leaves the Federal Circuit, at least one claim of one patent is finally adjudicated to have been infringed and not invalid or unenforceable (i.e., a win for the patent owner); ii) it has been finally determined that no claim has these characteristics (a win for the accused infringer). I include all dispositive decisions of the Federal Circuit, whether by precedential opinion, nonprecedential opinion, or per curiam affirmance without opinion under the courts Rule 36. $After_t$ is a binary variable denoting whether the underlying quarter is after the court announcement date. Definitions of the variables are provided in the Appendix A.3. Robust standard errors are reported in parentheses; *, **, and *** denote significance at the 10%, 5% and 1% level.

**Table 1.5:**
**Continued**

| | Dependent Variable: Diversified Acquisition Amount/Assets (in percentages)) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| VARIABLES | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| $Loser \times After$ | -0.062** | -0.056** | -0.062** | -0.061** | -0.063** | -0.064** | -0.038** | -0.059** |
| | (-2.25) | (-2.30) | (-2.18) | (-2.16) | (-2.12) | (-2.17) | (-2.10) | (-2.13) |
| Loser | -0.004 | 0.017 | -0.003 | -0.005 | -0.006 | -0.004 | -0.020 | -0.010 |
| | (-0.15) | (0.85) | (-0.13) | (-0.19) | (-0.22) | (-0.15) | (-0.81) | (-0.42) |
| After | 0.053** | 0.043** | 0.053** | 0.052** | 0.054** | 0.054** | 0.019 | 0.052** |
| | (2.32) | (2.28) | (2.32) | (2.32) | (2.35) | (2.35) | (0.89) | (2.29) |
| R&D | 0.034 | | 0.022 | 0.041 | -0.028 | 0.035 | -0.064 | -0.040 |
| | (0.20) | | (0.14) | (0.26) | (-0.17) | (0.21) | (-0.42) | (-0.27) |
| Sales/Assets | 0.023 | -0.021 | | 0.028 | 0.015 | 0.002 | -0.086 | 0.012 |
| | (0.22) | (-0.29) | | (0.27) | (0.14) | (0.02) | (-0.78) | (0.12) |
| Capex/Assets | 0.288 | 0.192 | 0.305 | | 0.286 | 0.304 | 0.281 | 0.322 |
| | (0.50) | (0.41) | (0.54) | | (0.50) | (0.53) | (0.49) | (0.57) |
| ROA | 1.202** | 0.891** | 1.196** | 1.187** | | 0.502 | 0.711* | 1.024* |
| | (2.02) | (2.03) | (2.01) | (2.03) | | (1.13) | (1.68) | (1.84) |
| ROE | -0.386* | -0.224 | -0.381* | -0.378* | -0.090 | | -0.160 | -0.361* |
| | (-1.76) | (-1.45) | (-1.75) | (-1.81) | (-0.55) | | (-0.98) | (-1.66) |
| B/M | 0.012 | 0.021 | 0.011 | 0.010 | 0.003 | 0.026 | | 0.014 |
| | (0.32) | (0.76) | (0.30) | (0.30) | (0.09) | (0.73) | | (0.38) |
| Log(Assets) | -0.000 | 0.000 | -0.000 | -0.001 | 0.001 | -0.000 | 0.001 | |
| | (-0.02) | (0.05) | (-0.09) | (-0.11) | (0.28) | (-0.03) | (0.21) | |
| Cash/Assets | -0.075 | -0.062 | -0.074 | -0.079 | -0.015 | -0.057 | -0.007 | |
| | (-0.85) | (-0.96) | (-0.84) | (-0.93) | (-0.18) | (-0.65) | (-0.09) | |
| | | | | | | | | |
| $N$ | 387 | 571 | 387 | 401 | 387 | 387 | 505 | 389 |
| $AdjR^2$ | 0.010 | 0.003 | 0.012 | 0.012 | 0.002 | 0.004 | 0.001 | 0.013 |
| $YearDummies$ | YES | YES | YES | YES | YES | YES | YES | YES |

t-statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%.

**Table 1.6:**
**Do Losers Make More Focused Acquisitions? (Fixed Effect Specification For Losers)**

This table presents results illustrating the relationship between outcome of a patent litigation and loser's (i.e, who was found infringing in the court) focused M&A activity in 4 quarters interval of the court announcement date. The exact specification is defined in Eq.(1.3). In this specification, the coefficient estimates shows the estimates of the average change in focused acquisitions for loser controlling for time-invariant unobservable characteristics by firm fixed effects. The dependant variable refers to the ratio of amount that infringer spent on focused acquisition scaled to the firm's total assets. I define acquisitions in which acquirer and target are in the same 2-digit SIC code as focused acquisition and define others as diversifying acquisitions. Losers consist of all alleged infringers who were found infringing at least a patent in a dispositive opinion in 1983-2011 period. I include all dispositive decisions of the Federal Circuit, whether by precedential opinion, nonprecedential opinion, or per curiam affirmance without opinion under the courts Rule 36. $After_t$ is a binary variable denoting whether the underlying quarter is after the court announcement date. Definitions of the variables are provided in the Appendix A.3. Robust standard errors are reported in parentheses; *, **, and *** denote significance at the 10%, 5% and 1% level.

**Table 1.6:**
**Continued**

| VARIABLES | Dependent Variable: Focused Acquisition Amount/Assets (in percentages)) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| After | 0.100** | 0.078** | 0.092* | 0.101** | 0.099** | 0.098** | 0.072* | 0.080* |
| | (2.03) | (2.08) | (1.88) | (2.15) | (2.03) | (2.04) | (1.82) | (1.85) |
| $R\&D$ | 1.438 | | 1.722 | 1.177 | 1.497 | 1.359 | 1.375 | 1.363 |
| | (1.21) | | (1.47) | (1.05) | (1.63) | (1.23) | (1.36) | (1.13) |
| Sales/Assets | 1.056 | 0.683 | | 1.015 | 1.029 | 1.063 | 0.930 | 0.924 |
| | (1.26) | (1.57) | | (1.27) | (1.35) | (1.27) | (1.28) | (1.09) |
| Capex/Assets | -1.541 | -1.482 | -1.409 | | -1.548 | -1.538 | -1.243 | -1.463 |
| | (-1.02) | (-1.25) | (-0.93) | | (-1.03) | (-1.02) | (-0.99) | (-0.96) |
| ROA | -0.212 | -0.982 | 1.155 | -0.431 | | -0.543 | -0.176 | 0.599 |
| | (-0.08) | (-0.53) | (0.47) | (-0.17) | | (-0.27) | (-0.08) | (0.22) |
| ROE | -0.118 | 0.129 | -0.154 | -0.094 | -0.151 | | -0.109 | -0.196 |
| | (-0.19) | (0.23) | (-0.24) | (-0.16) | (-0.32) | | (-0.21) | (-0.31) |
| B/M | 0.014 | 0.013 | -0.038 | 0.034 | 0.008 | 0.029 | | -0.018 |
| | (0.06) | (0.07) | (-0.18) | (0.16) | (0.04) | (0.14) | | (-0.08) |
| Cash/Assets | 0.937** | 0.738* | 0.892* | 0.917** | 0.932** | 0.942** | 0.767* | |
| | (2.03) | (1.76) | (1.93) | (2.04) | (2.05) | (2.05) | (1.95) | |
| $N$ | 151 | 232 | 151 | 159 | 151 | 151 | 182 | 151 |
| $AdjR^2$ | 0.082 | 0.052 | 0.069 | 0.072 | 0.082 | 0.082 | 0.067 | 0.050 |
| Year Dummies | YES | YES | YES | YES | YES | YES | YES | YES |
| Firm-Fixed Effects | YES | YES | YES | YES | YES | YES | YES | YES |

t-statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%.

**Table 1.7:**
**Do Winners Make More Focused Acquisitions? (Fixed Effect Specification For Winners)**

This table presents results illustrating the relationship between outcome of a patent litigation and winner's (i.e, the alleged infringer who prevailed in the court) focused M&A activity in 4 quarters interval of the court announcement date. The exact specification is defined in Eq.(1.3). In this specification, the coefficient estimates shows the estimates of the average change in focused acquisitions of winner controlling for time-invariant unobservable characteristics by firm fixed effects. The dependant variable refers to the ratio of amount that infringer spent on focused acquisition scaled to the firm's total assets. I define acquisitions in which acquirer and target are in the same 2-digit SIC code as focused acquisition and define others as diversifying acquisitions. Winners consist of all alleged infringers who prevailed in a dispositive decision in CAFC during 1983-2011 period. I define a case dispositive if it satisfies the following conditions: i) as it leaves the Federal Circuit, at least one claim of one patent is finally adjudicated to have been infringed and not invalid or unenforceable (i.e., a win for the patent owner); ii) it has been finally determined that no claim has these characteristics (a win for the accused infringer). I include all dispositive decisions of the Federal Circuit, whether by precedential opinion, nonprecedential opinion, or per curiam affirmance without opinion under the courts Rule 36. $After_t$ is a binary variable denoting whether the underlying quarter is after the court announcement date. Definitions of the variables are provided in the Appendix A.3. Robust standard errors are reported in parentheses; *, **, and *** denote significance at the 10%, 5% and 1% level.

**Table 1.7:**
**Continued**

| | Dependent Variable: Focused Acquisition Amount/Assets | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| VARIABLES | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| After | -0.019 | -0.013 | -0.034 | -0.018 | -0.019 | -0.019 | -0.015 | -0.018 |
| | (-0.69) | (-0.55) | (-1.22) | (-0.67) | (-0.69) | (-0.68) | (-0.78) | (-0.67) |
| $R\&D$ | 0.179 | | -0.109 | 0.230 | 0.198 | 0.190 | 0.231 | 0.189 |
| | (0.29) | | (-0.18) | (0.39) | (0.34) | (0.31) | (0.52) | (0.32) |
| Sales/Assets | 1.233** | 0.464 | | 1.224** | 1.240** | 1.247** | 1.026*** | 1.251** |
| | (2.41) | (1.34) | | (2.43) | (2.44) | (2.45) | (2.97) | (2.48) |
| Capex/Assets | -1.171 | -1.006 | -1.122 | | -1.169 | -1.187 | -0.913 | -1.157 |
| | (-1.10) | (-1.03) | (-1.04) | | (-1.10) | (-1.12) | (-1.17) | (-1.10) |
| ROA | -0.139 | 0.023 | -0.472 | -0.113 | | 0.153 | 0.019 | -0.101 |
| | (-0.11) | (0.03) | (-0.38) | (-0.09) | | (0.20) | (0.03) | (-0.08) |
| ROE | 0.142 | 0.093 | 0.247 | 0.168 | 0.100 | | 0.123 | 0.130 |
| | (0.30) | (0.38) | (0.52) | (0.36) | (0.34) | | (0.46) | (0.28) |
| B/M | -0.105 | -0.122 | -0.167 | -0.099 | -0.103 | -0.105 | | -0.116 |
| | (-0.93) | (-1.31) | (-1.52) | (-0.90) | (-0.93) | (-0.94) | | (-1.10) |
| Cash/Assets | 0.126 | 0.205 | 0.231 | 0.112 | 0.122 | 0.117 | 0.292 | |
| | (0.32) | (0.64) | (0.59) | (0.29) | (0.31) | (0.30) | (1.08) | |
| $N$ | 236 | 339 | 236 | 242 | 236 | 236 | 323 | 238 |
| $AdjR^2$ | 0.063 | 0.028 | 0.033 | 0.057 | 0.063 | 0.063 | 0.047 | 0.063 |
| Year Dummies | YES | YES | YES | YES | YES | YES | YES | YES |
| Firm-Fixed Effects | YES | YES | YES | YES | YES | YES | YES | YES |

t-statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%.

**Table 1.8:**
**Does Having Alternative Patent Increase Likelihood of Being Acquired?**

This table presents key coefficient estimates that illustrate whether target's having an alternative patent to the alleged infringed patent increases likelihood of being acquired by the alleged infringer. The specification for this table is a conditional logit model and is demonstrated in equation (1.4). Panel A and Panel B shows the results for alleged infringers who lost and prevailed in the lawsuit, respectively. The dependent variable is equal to one for the acquirer-actual target firm pair, and zero for three acquirer-control target pairs. The control targets are selected by propensity score matching to the actual target by industry, size and B/M. The regression includes deal fixed effects. Definitions of the variables are provided in the Appendix A.3.2. Z-statistics are reported in parentheses; *, **, and *** denote significance at the 10%, 5% and 1% level.

| Panel A: For Losers | (I) | (II) | (III) | (IV) |
|---|---|---|---|---|
| Alternative | 4.092*** | 2.167** | 3.169** | 2.529** |
| | (2.92) | (2.26) | (2.14) | (2.35) |
| Target Patents | | 0.313** | | |
| | | (2.12) | | |
| Knowledge Overlap | | | 0.301* | |
| | | | (1.65) | |
| Acquirer Base Overlap | | | | 14.561* |
| | | | | (1.69) |
| Target Base Overlap | | | | 11.378* |
| | | | | (1.85) |
| No. of Observations | 124 | 124 | 124 | 124 |
| No. of Actual Deals | 31 | 31 | 31 | 31 |
| No. of Control Deals | 93 | 93 | 93 | 93 |
| Pseudo $R^2$ | 0.10 | 0.12 | 0.10 | 0.13 |

**Table 1.9:**
**Does Having Alternative Patent Increase Likelihood of Being Acquired?**

This table presents key coefficient estimates that illustrate whether target's having an alternative patent to the alleged infringed patent increases likelihood of being acquired by the alleged infringer. The specification for this table is a conditional logit model and is demonstrated in equation (1.4). Panel A and Panel B shows the results for alleged infringers who lost and prevailed in the lawsuit, respectively. The dependent variable is equal to one for the acquirer-actual target firm pair, and zero for three acquirer-control target pairs. The control targets are selected by propensity score matching to the actual target by industry, size and B/M. The regression includes deal fixed effects. Definitions of the variables are provided in the Section A.3.2. Z-statistics are reported in parentheses; *, **, and *** denote significance at the 10%, 5% and 1% level.

| Panel B: For Winners | (I) | (II) | (III) | (IV) |
|---|---|---|---|---|
| Alternative | 2.56 | -4.445 | -4.949 | -5.177 |
| | (0.06) | (-0.01) | (-0.01) | (-0.01) |
| Target Patents | | 0.343*** | | |
| | | (3.11) | | |
| Knowledge Overlap | | | 0.995*** | |
| | | | (3.43) | |
| Acquirer Base Overlap | | | | 13.742* |
| | | | | (2.35) |
| Target Base Overlap | | | | 1.237 |
| | | | | (0.29) |
| Acq, Target Controls | NO | YES | YES | YES |
| Deal Fixed Effects | YES | YES | YES | YES |
| No. of Observations | 140 | 140 | 140 | 140 |
| No. of Actual Deals | 35 | 35 | 35 | 35 |
| No. of Control Deals | 105 | 105 | 105 | 105 |
| Pseudo $R^2$ | 0.15 | 0.13 | 0.11 | 0.14 |

## Table 1.10:
## Do Focused Acquisitions For Losers Get Abnormal Returns?

This table presents results illustrating the relationship between the acquirer abnormal return and type of the acquirer (i.e, loser or winner) and type of the acquisition (i.e, focused or diversifying). The exact specification is defined in Eqn. (1.5). In this specification, dependent variable is cumulative abnormal announcement returns (CAR[-1,1]) of all alleged infringers' M&A transactions in 3 years after the court announcement date. CAR[-1,1] is computed between day t = -1 to day t = +1 where t = 0 is the acquisition announcement date. Abnormal returns are calculated in three different approaches: value-weighted, equal-weighted and market model. In value-weighted (equal-weighted) approach, the abnormal returns results after subtracting the return of the CRSP value-weighted (equal-weighted) market index over event window. In market model, the abnormal return is calculated by subtracting return from market-based estimate. The parameters for the market model are estimated over the (-205, -6) interval. I define acquisitions in which acquirer and target are in the same 2-digit SIC code as focused acquisitions and others as diversifying acquisitions. *Loser* group consist of all alleged infringers who was found infringing at least one patent in CAFC during 1983-2011 period. Winner group consist of all alleged infringers who prevailed in CAFC during the same period. *Focused* × *Loser* is the interaction term calculated by multiplication of loser dummy and focused dummy. Dependant variable, The second columns of each approach presents estimates with additional dependent variables: transaction value (in $mil), target public status dummy, all cash dummy, acquirer market capitalization and relative size (transaction value divided by the equity market capitalization of the acquirer at the end of the fiscal year prior to the acquisition announcement). Significance is based on White-adjusted standard errors with t-statistics are reported below each coefficient in parenthesis.

### Dependent Variable: CAR[-1,1]

|  | Value-W | | Equal-W | | Market | |
|---|---|---|---|---|---|---|
|  | (I) | (II) | (I) | (II) | (I) | (II) |
| *Focused* × *Loser* | 0.17*** | 0.26*** | 0.16*** | 0.24** | 0.15*** | 0.25** |
|  | (2.75) | (2.69) | (2.69) | (2.45) | (2.73) | (2.59) |
| Loser | -0.002 | -0.007 | -0.004 | -0.008 | -0.003 | -0.006 |
|  | (-0.45) | (-0.99) | (-0.90) | (-1.14) | (-0.11) | (-0.80) |
| Focused | -0.007* | -0.010 | -0.005 | -0.007 | -0.008 | -0.009 |
|  | (-1.72) | (-1.55) | (-1.30) | (-1.12) | (-1.18) | (-0.92) |
| N | 386 | 172 | 386 | 172 | 386 | 172 |
| Other Controls | No | Yes | No | Yes | No | Yes |
| Adj. $R^2$ | 0.021 | 0.084 | 0.017 | 0.060 | 0.025 | 0.072 |

<div align="center">

**Table 1.11:**
**Some Recent Jury Damage Awards in District Courts**

</div>

| Date | Plaintiff | Defendant | Verdict($) | District | State |
|------|-----------|-----------|------------|----------|-------|
| June-09 | Centocor Inc. | Abbott Laboratories | 1,672,594,000 | E.D. | Tex. |
| March-07 | Alcatel-Lucent | Microsoft | 1,500,000,000 | S.D. | Cal. |
| Dec-12 | Carnegie Mellon University | Marvell Technology | 1,169,140,271 | W.D | PA |
| October-12 | Apple, Inc. | Samsung | 1,049,343,540 | N.D. | Cal. |
| August-12 | Monsanto Company | Pioneer Hi-Bred Int'l. | 1,000,000,000 | E.D. | Mo. |
| October-10 | Mirror Worlds LLC | Apple Inc | 625,500,000 | E.D. | Tex. |
| January-11 | Saffran M.D. | Johnson &Johnson | 482,000,000 | E.D. | Tex. |
| February-08 | Saffran | Boston Sci. | 431,867,351 | E.D. | Tex. |
| April-09 | Uniloc USA Inc. | Microsoft Corp. et al | 388,000,000 | | R.I. |
| November-12 | VirnetX Inc.Â | Cisco Systems, Inc. | 368,160,000 | E.D. | Tex. |
| April-08 | Alcatel-Lucent | Microsoft | 368,043,056 | S.D. | Cal. |
| May-11 | Versata Software Inc. | SAP America Inc. | 345,000,000 | E.D. | Tex. |
| April-06 | Hynix | Rambus | 306,900,000 | N.D. | Cal. |
| May-08 | Medtronic | Boston Scientific | 250,000,000 | E.D. | Tex. |
| September-07 | De Puy | Medtronic Sofamor | 226,300,000 | | Mass. |
| May-09 | i4i LP | Microsoft Corp | 200,000,000 | E.D. | Tex. |
| December-07 | C.R. Bard | Gore Assocs | 185,000,000 | | Ariz. |
| May-08 | Cornell | Hewlett-Packard Co | 184,044,048 | N.D. | N.Y. |
| September-07 | TGIP | AT&T | 156,000,000 | E.D. | Tex. |
| July-12 | Mformation Tech. | Research In Motion | 147,200,000 | N.D. | Cal. |
| August-09 | Versata Software Inc. | SAP America | 138,641,000 | E.D. | Tex. |
| April-06 | z4 | Microsoft | 133,000,000 | E.D. | Tex. |
| May-05 | Freedom Wireless | Boston Commun. | 128,025,000 | | Mass. |
| August-11 | Active Video Networks | Verizon Commc'n Inc. | 115,000,000 | E.D. | Va. |
| August-12 | WesternGeco, LLC | ION Geophysical Corp. | 105,900,000 | S.D. | Tex. |
| March-10 | VirnetX, Inc. | Microsoft Corp. | 105,750,000 | E.D. | Tex. |
| September-11 | Medtronic Sofamor | NuVasive Inc. | 101,196,000 | S.D. | Cal. |

**Table 1.12:**
**Court Outcomes**

This table presents the majority decision of dispositive patent infringement cases, in which one judge filed a dissenting opinion. The data covers all adjudicated cases in CAFC from 1/1/1983 to 31/12/2011. Similar to Janicke (2006), I define a case dispositive if it satisfies the following conditions: i) as it leaves the Federal Circuit, at least one claim of one patent is finally adjudicated to have been infringed and not invalid or unenforceable (i.e., a win for the patent owner); ii) it has been finally determined that no claim has these characteristics (a win for the accused infringer). I include all dispositive decisions of the Federal Circuit, whether by precedential opinion, nonprecedential opinion, or per curiam affirmance without opinion under the courts Rule 36.

| Result of the Case | Frequency | Percentage |
|---|---|---|
| Affirmed | 105 | 51.98 |
| Modified(In Part), Affirmed(In Part) | 2 | 0.99 |
| Reversed | 18 | 8.91 |
| Reversed (In Part), Affirmed(In Part) | 52 | 25.74 |
| Reversed (In Part), Vacated (In Part) | 4 | 1.98 |
| Vacated(In Part), Affirmed(In Part) | 21 | 10.39 |
| Total | 202 | 100.00 |

**Table 1.13:**
**Some Of The Recent Large Scale Patent Acquisitions**

| Date | Seller | Buyer | No. of patents | Price | Price /Patent |
|---|---|---|---|---|---|
| Dec-12 | Kodak | Consortium | 1100 | $525 mil | $470K |
| Nov-12 | Rockstar | Apple | 695 | $2.5 bil. | $3.59 mil. |
| Jul-12 | Fujifilm | Universal Display | 1200 | $105 mil. | $ 87K |
| Jun-12 | Interdigital | Intel | 1700 | $375 mil. | $220K |
| May-12 | Motorola Mobility | Google | 17,000+ | $5.5 B | $323 K |
| Apr-12 | AOL | Microsoft | 925 | $1.05 bil. | $1.13 mil. |
| Apr-12 | Microsoft | Facebook | 650 | $550 mil. | $840K |
| Mar-12 | IBM | Facebook | 750 | - | |
| Feb-12 | MOSAID | Google | 200 | - | |
| Jan-12 | Real Networks | Intel | 190 (+170 apps) | $120M | $632K |
| Jan-12 | IBM | Google | 188 (+ 29 apps) | - | |
| Jan-12 | Adaptix | Acacia | 230 | $100 mil. | $43K |
| Oct-11 | MOSAID | Sterling Partners | 5385 | $596 M | $110 K |
| Sep-11 | MOSAID | Google | 18 | $11 M | $610 K |
| Sep-11 | Core Wireless, S.a.r.l. | MOSAID | 2000 (incl. apps) | N/AÂ | |
| Aug-11 | Glenayre Elect. | Wi-LAN | 60 | $8 M | $133 K |
| Aug-11 | Google | HTC | 9 | -Â | |
| Aug-11 | IBM | Google | 1023 | -Â | |
| Jul-11 | IBM | Google | 1030 | - | |
| Jul-11 | S3 | HTC | 235 | $300 M | $1.3 M |
| Jul-11 | Nortel | Rockstar Bidco Syn. | 6000* | $4.5 B | $750 K |
| May-11 | Hynix | Mosaid | 500 | - | |
| May-11 | IBM | Google | 1000 | -Â | |
| Apr-11 | ADC Telecomm. | HTC | 82 | $75M | 915 K |
| Mar-11 | Kodak | Omnivision | 850 | $65M | 76 K |
| Nov-10 | Novell | CPTN Holdings Syn. | 882 | $450 M | $510 K |
| Aug-10 | Friendster (MOL Global) | Facebook | 7 (+ 11 apps) | $40M | $5.7M |
| Apr-10 | Palm | HP | 1500+ | $1.2B | $800 K |

**Table 1.14:**
**Composition of the Court of Appeals for the Federal Circuit (as of Sep-2013)**

The Federal Circuit may have a total of 12 active circuit judges sitting at any given time, who are required to reside within 50 miles of the District of Columbia, as set by 28 U.S.C. § 44. Judges on senior status are not subject to this restriction. As with other federal judges, they are nominated by the President and must be confirmed by the Senate. Their terms last during the "good behavior" of the judges, which typically results in life tenure. When eligible, judges may elect to take senior status. This allows a senior judge to continue to serve on the court while handling fewer cases than an active service judge. Each judge in active service employs a judicial assistant and up to four law clerks, while each judge in senior status employs a judicial assistant and one law clerk.

| No | Title | Judge | Born | Active | Chief | Senior |
|----|-------|-------|------|--------|-------|--------|
| 24 | Chief Judge | Randall Ray Rader | 1949 | 1990-present | 2010-present | - |
| 16 | Circuit Judge | Pauline Newman | 1927 | 1984-present | - | - |
| 22 | Circuit Judge | Alan David Lourie | 1935 | 1990-present | - | - |
| 29 | Circuit Judge | Timothy B. Dyk | 1937 | 2000-present | - | - |
| 30 | Circuit Judge | Sharon Prost | 1951 | 2001-present | - | - |
| 31 | Circuit Judge | Kimberly Ann Moore | 1968 | 2006-present | - | - |
| 32 | Circuit Judge | Kathleen M. O'Malley | 1956 | 2010-present | - | - |
| 33 | Circuit Judge | Jimmie V. Reyna | 1952 | 2011-present | - | - |
| 34 | Circuit Judge | Evan Wallach | 1949 | 2011-present | - | - |
| 35 | Circuit Judge | Richard G. Taranto | 1957 | 2013-present | - | - |
| 36 | Circuit Judge | Raymond T. Chen | 1968 | 2013-present | - | - |
| 37 | Circuit Judge | Todd M. Hughes | 1966 | 2013-present | - | - |
| 19 | Senior Circuit Judge | Haldane Robert Mayer | 1941 | 1987-2010 | 1997-2004 | 2010 |
| 21 | Senior Circuit Judge | S. Jay Plager | 1931 | 1989-2000 | - | 2000 |
| 23 | Senior Circuit Judge | Raymond Charles Clevenger III | 1937 | 1990-2006 | - | 2006 |
| 25 | Senior Circuit Judge | Alvin Anthony Schall | 1944 | 1992-2009 | - | 2009 |
| 26 | Senior Circuit Judge | William Curtis Bryson | 1945 | 1994-2013 | - | 2013 |
| 28 | Senior Circuit Judge | Richard Linn | 1944 | 1999-2012 | - | 2012 |

**Table 1.15:**
**List of Former Judges in Court of Appeals for the Federal Circuit (as of Sep-2013)**

The Federal Circuit may have a total of 12 active circuit judges sitting at any given time, who are required to reside within 50 miles of the District of Columbia, as set by 28 U.S.C. § 44. Judges on senior status are not subject to this restriction. As with other federal judges, they are nominated by the President and must be confirmed by the Senate. Their terms last during the "good behavior" of the judges, which typically results in life tenure. When eligible, judges may elect to take senior status. This allows a senior judge to continue to serve on the court while handling fewer cases than an active service judge. Each judge in active service employs a judicial assistant and up to four law clerks, while each judge in senior status employs a judicial assistant and one law clerk.

| No | Judge | Born/Died | Active service | Chief Judge | Senior status | Termination |
|----|-------|-----------|----------------|-------------|---------------|-------------|
| 1 | Don Nelson Laramore | 1906-1989 | - | - | 1982-1989 | death |
| 2 | Giles Sutherland Rich | 1904-1999 | 1982-1999 | - | - | death |
| 3 | James Lindsay Almond, Jr. | 1898-1986 | - | - | 1982-1986 | death |
| 4 | Oscar Hirsh Davis | 1914-1988 | 1982-1988 | - | - | death |
| 5 | Arnold Wilson Cowen | 1905-2007 | - | - | 1982-2007 | death |
| 6 | Philip Nichols, Jr. | 1907-1990 | 1982-1983 | - | 1983-1990 | death |
| 7 | Byron George Skelton | 1905-2004 | - | - | 1982-2004 | death |
| 8 | Phillip Benjamin Baldwin | 1924-2002 | 1982-1986 | - | 1986-1991 | retirement |
| 9 | Howard Thomas Markey | 1920-2006 | 1982-1991 | 1982-1990 | - | retirement |
| 10 | Marion Tinsley Bennett | 1914-2000 | 1982-1986 | - | 1986-2000 | death |
| 11 | Shiro Kashiwa | 1912-1998 | 1982-1986 | - | - | retirement |
| 12 | Jack Richard Miller | 1916-1994 | 1982-1985 | - | 1985-1994 | death |
| 13 | Daniel Mortimer Friedman | 1916-2011 | 1982-1989 | - | 1989-2011 | death |
| 14 | Edward Samuel Smith | 1919-2001 | 1982-1989 | - | 1989-2001 | death |
| 15 | Helen Wilson Nies | 1925-1996 | 1982-1995 | 1990-1994 | 1995-1996 | death |
| 17 | Jean Galloway Bissell | 1936-1990 | 1984-1990 | - | - | death |
| 18 | Glenn Leroy Archer, Jr. | 1929-2011 | 1985-1997 | 1994-1997 | 1997-2011 | death |
| 20 | Paul Redmond Michel | 1941- | 1988-2010 | 2004-2010 | - | retirement |
| 27 | Arthur J. Gajarsa | 1941- | 1997-2011 | - | 2011-2012 | retirement |

**Table 1.16:**
**Dissent Rates of Judges in CAFC**

This table represents the number of panel attendance, dissenting opinion and percentage of dissents for each of CAFC judges from 1983 to 2011. The search was conducted with the following keywords: "DIS(Judge Name) & PA(Judge Name) & TO(Patent)".

| No | Judge | Number of Panel Attendance | Number of Dissent | % of Dissent |
|----|-------|---------------------------|-------------------|--------------|
| 1 | Don Nelson Laramore | 0 | 0 | - |
| 2 | Giles Sutherland Rich | 349 | 11 | 0.03 |
| 3 | James Lindsay Almond, Jr. | 0 | 0 | - |
| 4 | Oscar Hirsh Davis | 150 | 16 | 0.11 |
| 5 | Arnold Wilson Cowen | 91 | 3 | 0.03 |
| 6 | Philip Nichols, Jr. | 82 | 5 | 0.06 |
| 7 | Byron George Skelton | 110 | 1 | 0.01 |
| 8 | Phillip Benjamin Baldwin | 159 | 5 | 0.03 |
| 9 | Howard Thomas Markey | 271 | 4 | 0.01 |
| 10 | Marion Tinsley Bennett | 109 | 5 | 0.05 |
| 11 | Shiro Kashiwa | 66 | 4 | 0.06 |
| 12 | Jack Richard Miller | 113 | 10 | 0.09 |
| 13 | Daniel Mortimer Friedman | 345 | 7 | 0.02 |
| 14 | Edward Samuel Smith | 197 | 12 | 0.06 |
| 15 | Helen Wilson Nies | 254 | 18 | 0.07 |
| 16 | Pauline Newman | 977 | 155 | 0.16 |
| 17 | Jean Galloway Bissell | 113 | 3 | 0.03 |
| 18 | Glenn Leroy Archer, Jr. | 385 | 9 | 0.02 |
| 19 | Haldane Robert Mayer | 672 | 68 | 0.10 |
| 20 | Paul Redmond Michel | 703 | 22 | 0.03 |
| 21 | S. Jay Plager | 377 | 14 | 0.04 |
| 22 | Alan David Lourie | 909 | 41 | 0.05 |
| 23 | Raymond Charles Clevenger III | 547 | 24 | 0.04 |
| 24 | Randall Ray Rader | 948 | 36 | 0.04 |
| 25 | Alvin Anthony Schall | 626 | 19 | 0.03 |

**Table 1.16: Continued**

| No | Judge | Number of Panel Attendance | Number of Dissent | % of Dissent |
|----|-------|---------------------------|-------------------|--------------|
| 26 | William Curtis Bryson | 765 | 30 | 0.04 |
| 27 | Arthur J. Gajarsa | 582 | 27 | 0.05 |
| 28 | Richard Linn | 559 | 22 | 0.04 |
| 29 | Timothy B. Dyk | 633 | 59 | 0.09 |
| 30 | Sharon Prost | 586 | 29 | 0.05 |
| 31 | Kimberly Ann Moore | 301 | 17 | 0.06 |
| 32 | Kathleen M. O'Malley | 108 | 11 | 0.10 |
| 33 | Jimmie V. Reyna | 103 | 13 | 0.13 |
| 34 | Evan Wallach | 60 | 4 | 0.07 |
| 35 | Richard G. Taranto | 10 | 1 | 0.10 |
| 36 | Raymond T. Chen | 0 | 0 | - |
| 37 | Todd M. Hughes | 0 | 0 | - |

**Table 1.17:**
**Number of Patent Lawsuit Filed In Each District Court**

Source: Lex Machina Database

| Court | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|
| Central District of California | 240 | 258 | 320 | 187 | 267 | 216 | 308 | 499 |
| Central District of Illinois | 4 | 6 | 10 | 6 | 5 | 3 | 2 | 5 |
| District of Alaska | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| District of Arizona | 26 | 25 | 21 | 23 | 23 | 17 | 28 | 35 |
| District of Colorado | 32 | 45 | 32 | 33 | 35 | 37 | 47 | 65 |
| District of Columbia | 6 | 12 | 22 | 19 | 13 | 14 | 14 | 11 |
| District of Connecticut | 28 | 40 | 23 | 28 | 17 | 33 | 24 | 23 |
| District of Delaware | 113 | 132 | 157 | 166 | 228 | 253 | 484 | 1002 |
| District of Guam | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| District of Hawaii | 8 | 3 | 2 | 2 | 1 | 1 | 10 | 11 |
| District of Idaho | 1 | 2 | 6 | 3 | 3 | 5 | 2 | 8 |
| District of Kansas | 11 | 11 | 9 | 13 | 11 | 5 | 12 | 7 |
| District of Maine | 2 | 2 | 4 | 7 | 3 | 0 | 1 | 8 |
| District of Maryland | 28 | 20 | 24 | 24 | 29 | 19 | 31 | 42 |
| District of Massachusetts | 72 | 69 | 55 | 49 | 59 | 69 | 86 | 80 |
| District of Minnesota | 75 | 63 | 51 | 46 | 46 | 63 | 78 | 64 |
| District of Montana | 2 | 1 | 0 | 1 | 0 | 0 | 2 | 2 |
| District of Nebraska | 8 | 9 | 7 | 9 | 7 | 8 | 10 | 14 |
| District of Nevada | 28 | 35 | 20 | 21 | 15 | 28 | 30 | 32 |
| District of New Hampshire | 7 | 7 | 8 | 7 | 3 | 3 | 6 | 8 |
| District of New Jersey | 102 | 140 | 196 | 159 | 143 | 153 | 177 | 159 |
| District of New Mexico | 3 | 2 | 2 | 1 | 4 | 8 | 2 | 2 |
| District of North Dakota | 5 | 3 | 3 | 2 | 0 | 1 | 0 | 2 |
| District of Oregon | 35 | 35 | 22 | 20 | 22 | 15 | 29 | 29 |
| District of Puerto Rico | 0 | 0 | 0 | 1 | 1 | 0 | 3 | 7 |
| District of Rhode Island | 2 | 6 | 2 | 5 | 2 | 4 | 1 | 3 |
| District of South Carolina | 18 | 13 | 14 | 10 | 4 | 13 | 11 | 12 |
| District of South Dakota | 1 | 3 | 1 | 3 | 0 | 1 | 2 | 0 |
| District of Utah | 40 | 44 | 41 | 36 | 29 | 52 | 52 | 66 |
| District of Vermont | 2 | 2 | 1 | 3 | 2 | 2 | 11 | 8 |
| District of Virgin Islands | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| District of Wyoming | 2 | 1 | 3 | 2 | 1 | 5 | 1 | 0 |

| Court | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|
| Eastern District of Arkansas | 3 | 4 | 4 | 2 | 6 | 2 | 4 | 6 |
| Eastern District of California | 9 | 11 | 6 | 6 | 12 | 8 | 24 | 18 |
| Eastern District of Kentucky | 7 | 2 | 7 | 5 | 2 | 1 | 2 | 4 |
| Eastern District of Louisiana | 13 | 6 | 8 | 4 | 4 | 7 | 7 | 3 |
| Eastern District of Michigan | 49 | 54 | 53 | 60 | 47 | 57 | 62 | 43 |
| Eastern District of Missouri | 21 | 37 | 34 | 32 | 30 | 18 | 17 | 27 |
| Eastern District of New York | 50 | 36 | 28 | 30 | 34 | 15 | 33 | 30 |
| Eastern District of North Carolina | 5 | 6 | 10 | 22 | 8 | 12 | 7 | 19 |
| Eastern District of Oklahoma | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| Eastern District of Pennsylvania | 44 | 41 | 46 | 36 | 32 | 37 | 30 | 53 |
| Eastern District of Tennessee | 5 | 4 | 6 | 4 | 8 | 11 | 5 | 10 |
| Eastern District of Texas | 150 | 262 | 358 | 289 | 235 | 283 | 414 | 1248 |
| Eastern District of Virginia | 42 | 28 | 41 | 61 | 51 | 62 | 72 | 87 |
| Eastern District of Washington | 1 | 2 | 3 | 3 | 1 | 3 | 5 | 0 |
| Eastern District of Wisconsin | 26 | 43 | 23 | 24 | 26 | 18 | 31 | 27 |
| Middle District of Alabama | 0 | 1 | 1 | 0 | 1 | 1 | 3 | 1 |
| Middle District of Florida | 49 | 52 | 62 | 44 | 43 | 63 | 78 | 77 |
| Middle District of Georgia | 1 | 4 | 2 | 5 | 2 | 5 | 2 | 2 |
| Middle District of Louisiana | 4 | 0 | 2 | 3 | 0 | 0 | 4 | 2 |
| Middle District of North Carolina | 18 | 19 | 14 | 10 | 15 | 12 | 17 | 15 |
| Middle District of Pennsylvania | 4 | 10 | 3 | 6 | 6 | 4 | 3 | 9 |
| Middle District of Tennessee | 5 | 11 | 6 | 7 | 3 | 4 | 9 | 7 |
| Northern District of Alabama | 8 | 4 | 4 | 5 | 5 | 5 | 6 | 6 |
| Northern District of California | 178 | 141 | 134 | 162 | 163 | 175 | 217 | 260 |
| Northern District of Florida | 3 | 3 | 2 | 0 | 2 | 5 | 9 | 13 |
| Northern District of Georgia | 57 | 72 | 56 | 58 | 39 | 48 | 48 | 66 |
| Northern District of Illinois | 136 | 124 | 140 | 144 | 132 | 172 | 215 | 236 |
| Northern District of Indiana | 6 | 16 | 9 | 10 | 17 | 11 | 4 | 6 |
| Northern District of Iowa | 6 | 3 | 0 | 3 | 1 | 6 | 1 | 3 |
| Northern District of Mississippi | 0 | 1 | 3 | 1 | 2 | 1 | 0 | 0 |
| Northern District of New York | 13 | 9 | 11 | 8 | 10 | 10 | 5 | 12 |
| Northern District of Ohio | 34 | 43 | 37 | 48 | 41 | 32 | 43 | 45 |
| Northern District of Oklahoma | 3 | 7 | 6 | 6 | 8 | 8 | 8 | 7 |
| Northern District of Texas | 54 | 41 | 42 | 41 | 36 | 39 | 46 | 57 |
| Northern District of West Virginia | 2 | 2 | 3 | 4 | 11 | 6 | 6 | 5 |
| Southern District of Alabama | 3 | 1 | 0 | 0 | 0 | 1 | 2 | 1 |
| Southern District of California | 60 | 51 | 59 | 67 | 71 | 55 | 79 | 141 |
| Southern District of Florida | 65 | 62 | 65 | 32 | 43 | 64 | 63 | 133 |

**Table 1.17: Continued**

| Court | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|-------|------|------|------|------|------|------|------|------|
| Southern District of Georgia | 3 | 2 | 2 | 1 | 2 | 0 | 0 | 1 |
| Southern District of Illinois | 5 | 2 | 6 | 6 | 1 | 1 | 3 | 2 |
| Southern District of Indiana | 16 | 22 | 16 | 27 | 23 | 44 | 26 | 23 |
| Southern District of Iowa | 11 | 7 | 11 | 9 | 13 | 8 | 7 | 2 |
| Southern District of Mississippi | 2 | 1 | 3 | 0 | 1 | 2 | 5 | 4 |
| Southern District of New York | 130 | 107 | 102 | 105 | 111 | 104 | 150 | 141 |
| Southern District of Ohio | 23 | 28 | 20 | 22 | 30 | 16 | 23 | 27 |
| Southern District of Texas | 51 | 27 | 28 | 30 | 37 | 34 | 33 | 46 |
| Southern District of West Virginia | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 3 |
| Western District of Arkansas | 5 | 2 | 1 | 3 | 10 | 4 | 1 | 1 |
| Western District of Kentucky | 1 | 6 | 6 | 4 | 3 | 7 | 4 | 8 |
| Western District of Louisiana | 8 | 5 | 4 | 6 | 4 | 3 | 1 | 4 |
| Western District of Michigan | 19 | 8 | 10 | 16 | 7 | 13 | 15 | 12 |
| Western District of Missouri | 13 | 14 | 13 | 9 | 5 | 9 | 9 | 14 |
| Western District of New York | 16 | 18 | 22 | 20 | 9 | 17 | 7 | 15 |
| Western District of North Carolina | 22 | 19 | 18 | 16 | 8 | 13 | 24 | 20 |
| Western District of Oklahoma | 5 | 7 | 5 | 5 | 6 | 3 | 7 | 14 |
| Western District of Pennsylvania | 18 | 17 | 18 | 14 | 16 | 16 | 11 | 39 |
| Western District of Tennessee | 11 | 8 | 7 | 7 | 1 | 4 | 2 | 31 |
| Western District of Texas | 38 | 17 | 15 | 13 | 22 | 34 | 41 | 55 |
| Western District of Virginia | 7 | 5 | 1 | 3 | 8 | 5 | 12 | 3 |
| Western District of Washington | 40 | 30 | 44 | 42 | 38 | 51 | 61 | 43 |
| Western District of Wisconsin | 20 | 26 | 49 | 40 | 25 | 38 | 44 | 31 |
| Totals | 2499 | 2581 | 2747 | 2527 | 2502 | 2715 | 3532 | 5423 |

# 1.8 Figures

**Figure 1.1:**
**US Court of Appeals & District Courts Map**

Source: http://en.wikipedia.org/wiki/United-States-courts-of-appeals



**Geographic Boundaries**
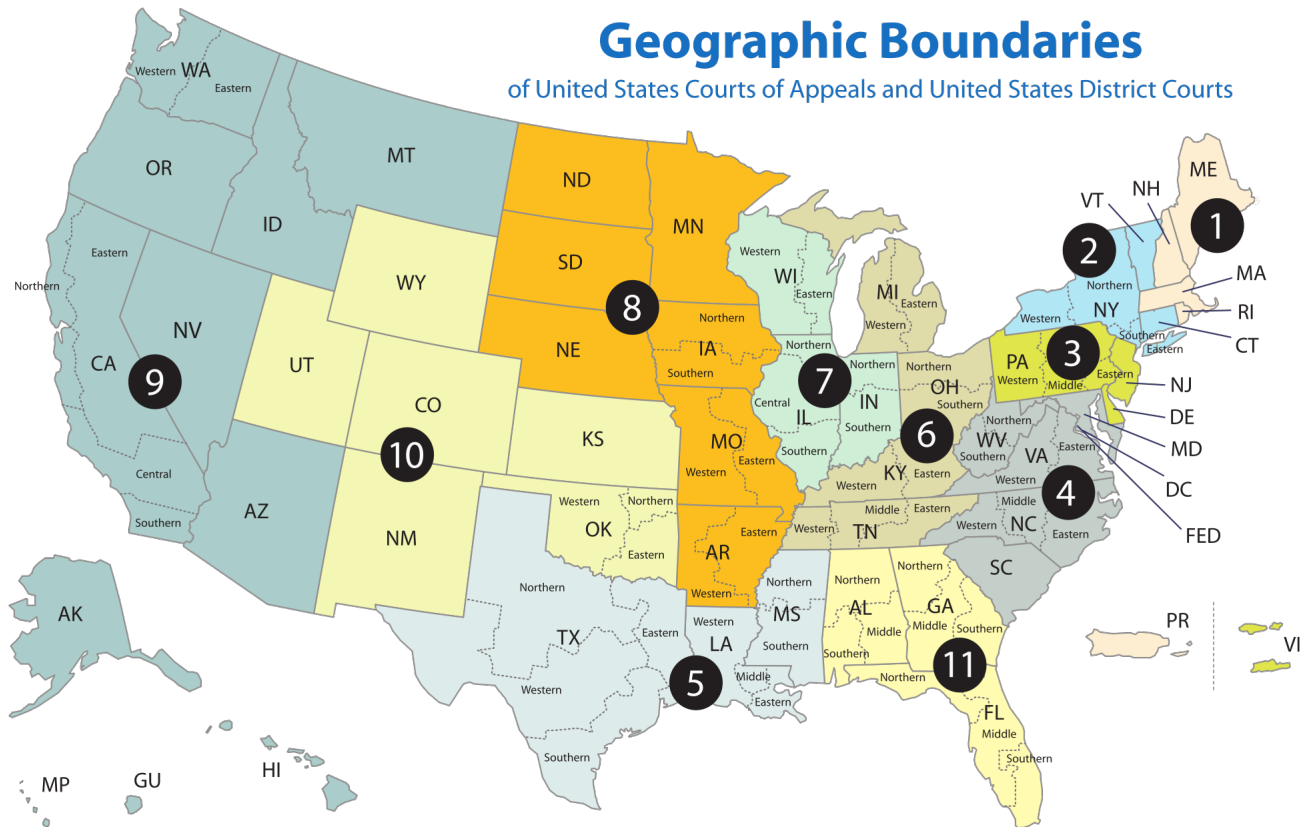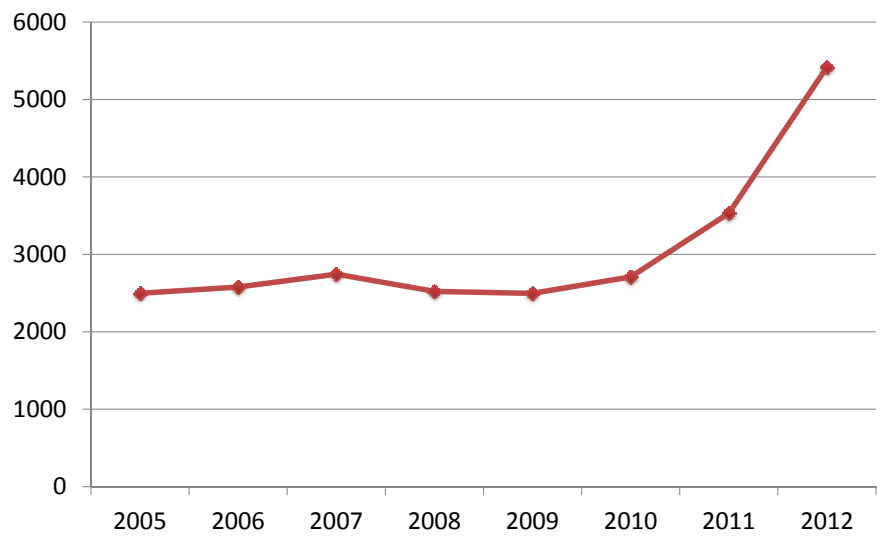of United States Courts of Appeals and United States District Courts
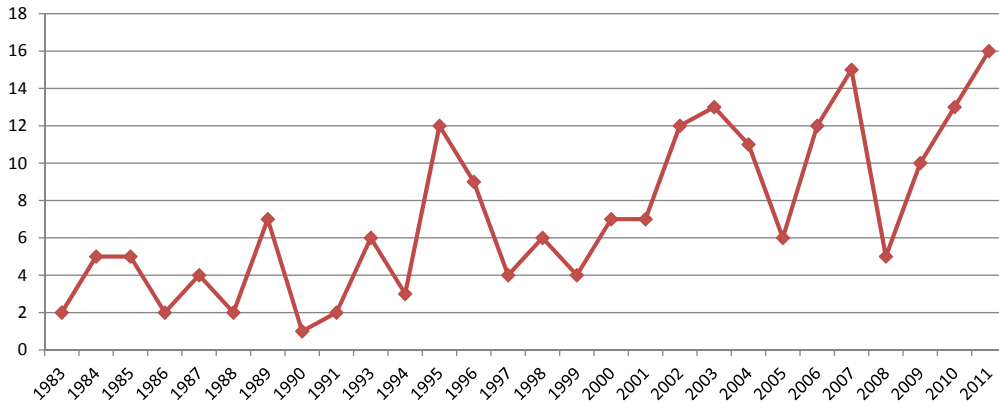
**Figure 1.2:**
**Number of Patent Lawsuits**

This figure shows the number of patent lawsuits filed in U.S District Courts. (Source: LexMachina Database)

This figure shows the number of dissenting dispositive court opinions by year. The sample is created as follows: first, I search all U.S. Court of Appeals for the Federal Circuit Opinions from 1/1/1983 to 31/12/2011 with the keywords "dissent! and patent". This search returns 757 court opinions; 662 of these opinions are related with patent law and the rest is about other type of laws including civil procedure, trademark law, copyright law etc. 199 out of 658 cases are appeals raised from United States Patent and Trademark Office (USPTO) or International Trade Commission (ITC). Since my interest in this paper is only the appeals raised from U.S District Courts, I eliminate appeals from these governmental offices. This filtering leaves me with 459 court opinions. To include into my sample, I read each opinion whether it is a "dispositive" one, which means that as it leaves the Federal Circuit, at least one claim of one patent is finally adjudicated to have been infringed and not invalid or unenforceable (i.e., a win for the patent owner), or in which it has been finally determined that no claim has these characteristics (a win for the accused infringer). I include all dispositive decisions of the Federal Circuit, whether by precedential opinion, nonprecedential opinion, or per curiam affirmance without opinion under the court's Rule 36. Then, I check the history of each case to make sure that this case was not appealed to the Supreme Court or reheard in an enbanc decision in a later stage. After excluding non-dissenting decisions and using these filters, I get 202 dispositive opinions, in which one of the judges have a dissenting opinion.

## Number of Dissenting Cases



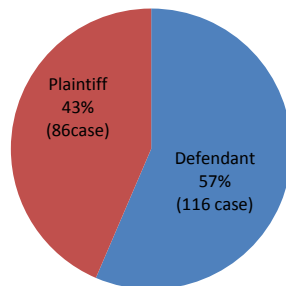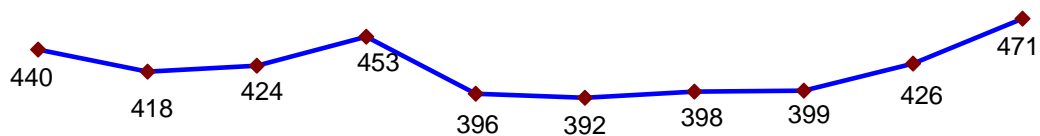## Winners

**Figure 1.4:**
**Patent Caseload in CAFC**

**United States Court of Appeals for the Federal Circuit**

**Filings of Patent Infringement Appeals**
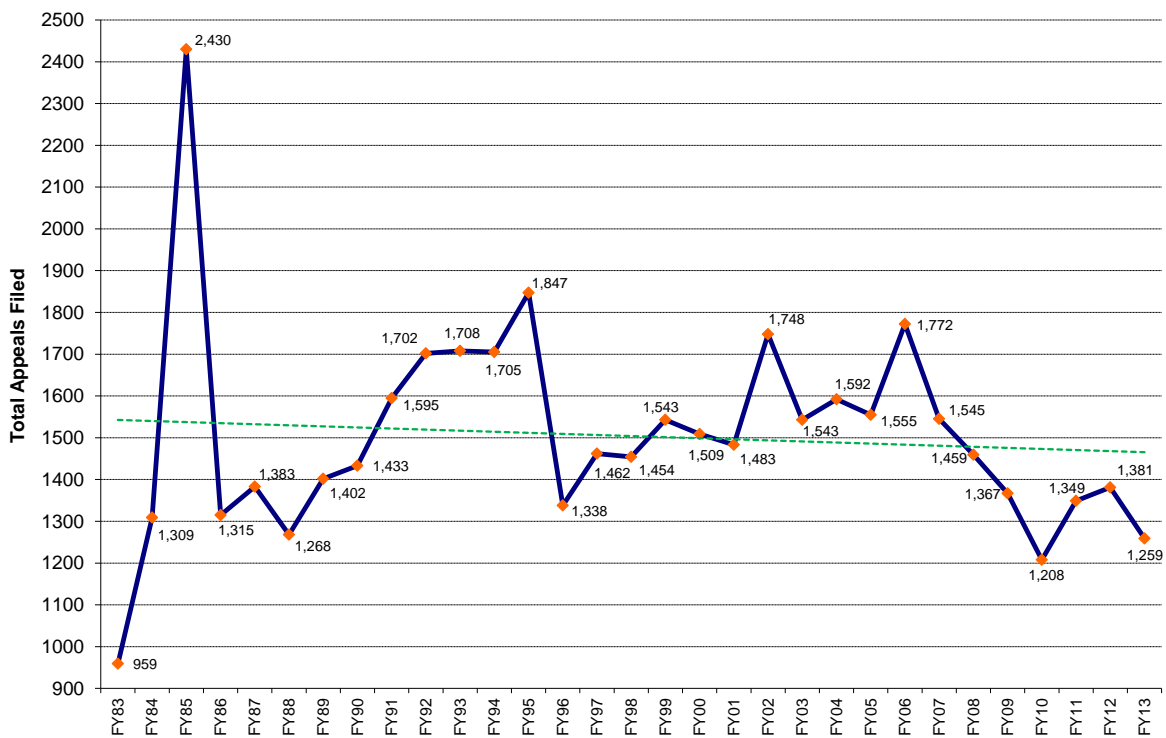**from the U.S. District Courts**



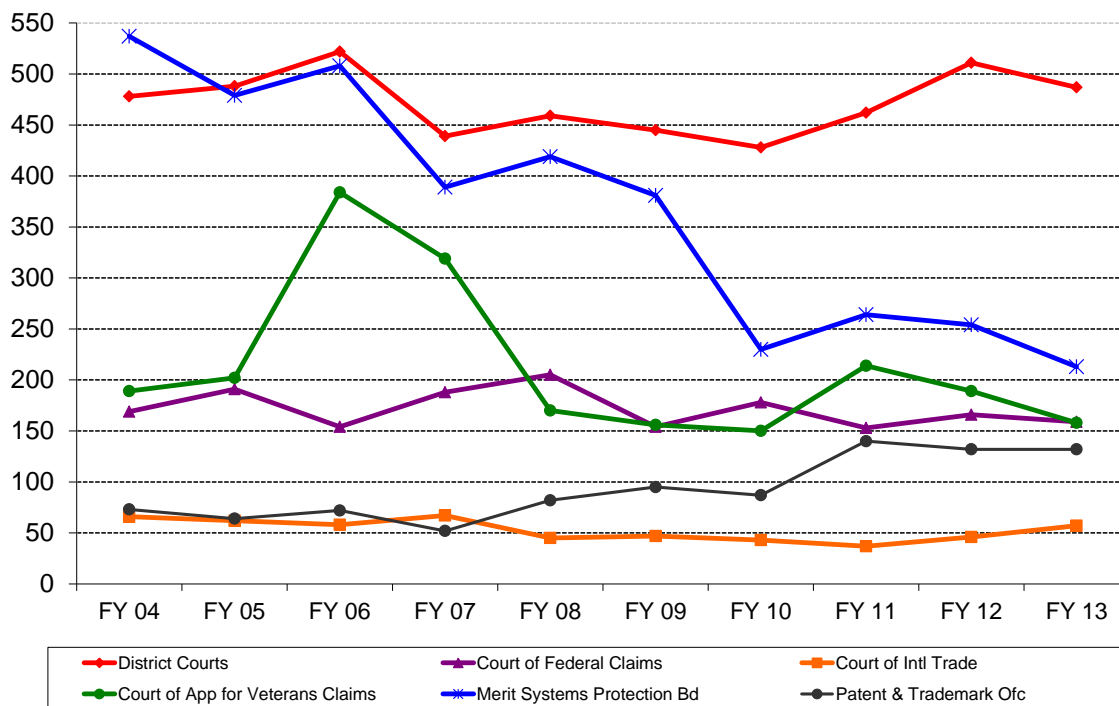| FY 03 | FY 04 | FY 05 | FY 06 | FY 07 | FY 08 | FY 09 | FY 10 | FY 11 | FY 12 |

Note: Includes reinstated, cross- and consolidated appeals.

**United States Court of Appeals for the Federal Circuit**
**Historical Caseload**



Notes: Includes reinstated, cross- and consolidated appeals. FY13 data is derived from the CMECF database. Prior years were derived from the court's legacy database.

**Figure 1.6:**
**Caseload in CAFC by Origin**

**United States Court of Appeals for the Federal Circuit**

**Appeals Filed in Major Origins**



Notes: Includes reinstated, cross-, and consolidated appeals. FY13 data is derived from the CMECF database. Prior years were derived from the court's legacy database.

**United States Court of Appeals for the Federal Circuit**

**Median Disposition Time
for Cases Decided by Merits Panels**

**United States Court of Appeals for the Federal Circuit**

Median Time to Disposition in Cases Terminated After Hearing or Submission[1]

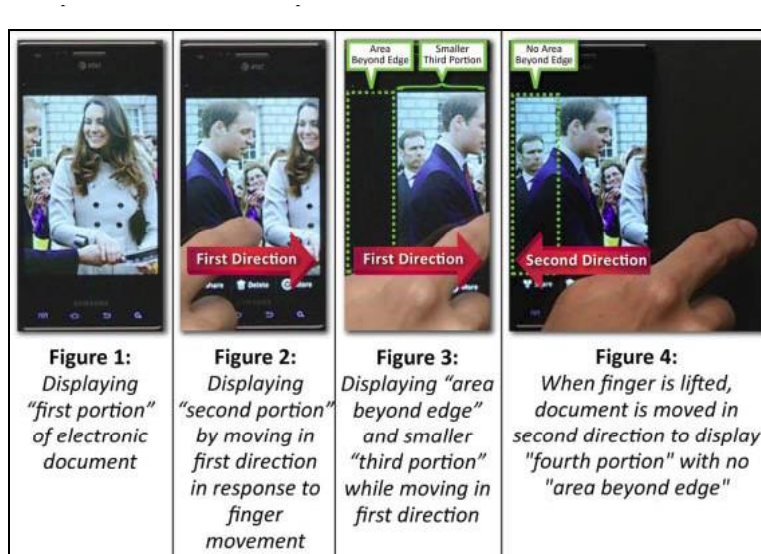Docketing Date[2] to Disposition Date, in Months

| | FY 04 | FY 05 | FY 06 | FY 07 | FY 08 | FY 09 | FY 10 | FY 11 | FY 12 | FY 13 | Overall Median per Origin |
|---|---|---|---|---|---|---|---|---|---|---|---|
| District Court | 11.7 | 11.6 | 11.5 | 11.6 | 11.0 | 11.0 | 11.0 | 11.2 | 11.8 | 11.8 | 11.3 |
| Court of Federal Claims | 11.0 | 11.2 | 10.0 | 10.0 | 9.2 | 10.3 | 10.0 | 10.6 | 9.9 | 10.4 | 10.3 |
| Court of International Trade | 12.0 | 11.5 | 11.7 | 11.9 | 12.4 | 11.5 | 11.0 | 12.2 | 12.6 | 12.4 | 11.8 |
| Court of Appeals Veterans Claims | 10.0 | 9.9 | 8.4 | 8.4 | 8.0 | 9.3 | 9.3 | 6.0 | 8.6 | 11.2 | 9.1 |
| Board of Contract Appeals | 9.7 | 10.5 | 11.7 | 10.4 | 9.6 | 11.9 | 8.8 | 10.0 | 11.5 | 13.3 | 10.8 |
| Department of Veterans Affairs | n/a | 14.4 | 13.7 | 11.3 | 4.8 | 18.9 | n/a | 19.4 | 15.7 | n/a | 14.4 |
| Department of Justice | n/a | n/a | n/a | n/a | n/a | 8.9 | 8.9 | n/a | n/a | 9.7 | 9.7 |
| International Trade Commission | 16.0 | 16.4 | 15.6 | 13.6 | 14.4 | 14.4 | 14.8 | 14.6 | 16.1 | 13.7 | 14.4 |
| Merit Systems Protection Board | 6.9 | 7.5 | 6.5 | 6.4 | 5.8 | 6.5 | 6.1 | 6.1 | 6.4 | 7.4 | 6.5 |
| Office of Compliance | 10.1 | 13.3 | 14.0 | n/a | 19.0 | n/a | 13.0 | 15.0 | n/a | n/a | 13.6 |
| Patent and Trademark Office | 9.6 | 10.3 | 10.0 | 9.6 | 8.9 | 9.3 | 8.2 | 11.2 | 11.7 | 10.1 | 10.0 |
| **Overall Median per Fiscal Year** | 10.0 | 9.9 | 9.3 | 9.1 | 9.0 | 9.3 | 9.1 | 9.7 | 9.9 | 10.6 | |

[1]  Excludes cross and consolidated appeals, writs, and OPM petitions
[2]  Calculated from Date of Docketing or Date of Reinstatement, whichever is later

**Figure 1.9:** Apple's Motion for Infringement



Figure 1:
Displaying "first portion" of electronic document

Figure 2:
Displaying "second portion" by moving in first direction in response to finger movement

Figure 3:
Displaying "area beyond edge" and smaller "third portion" while moving in first direction

Figure 4:
When finger is lifted, document is moved in second direction to display "fourth portion" with no "area beyond edge"

# Chapter 2

# Do Uncertainties in Bankruptcy Law Affect Optimal Loan Contracts? A Quasi Natural Experiment

It is difficult to make a law that can encompass all potential scenarios that may thereafter arise and has its stated and perceived goals. The situation may be especially more severe for the bankruptcy law, which needs to be quickly adjusted to dynamically changing structures of corporations. If law makers are not swift to take the necessary steps, then contours of the bankruptcy law are shaped in court rooms as well as in the Congress. Resulting subjective decisions in bankruptcies may lead to uncertainty for the creditors and may yield a chaos in the financial system. Hence, it is important to explore whether and how much the uncertainties in the U.S bankruptcy law affect the U.S syndicated loan market.

In this paper, I investigate probably the most important and unpredictable Chapter 11 doctrine, substantive consolidation (subcon). Even though subcon has been the subject of extensive media coverage and has been debated among law scholars about its theoretical origins and legal interpretation of controversies between the lower and upper court decisions[1],

---

[1]Widen (2006), Sprayregen and Friedland (2005), Brasher (2006) and Baird (2005).

65

# Chapter 2

# Do Uncertainties in Bankruptcy Law Affect Optimal Loan Contracts? A Quasi Natural Experiment

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In this paper, I investigate probably the most important and unpredictable Chapter 11 doctrine, substantive consolidation (subcon). Even though subcon has been the subject of extensive media coverage and has been debated among law scholars about its theoretical origins and legal interpretation of controversies between the lower and upper court decisions[1],

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[1]Widen (2006), Sprayregen and Friedland (2005), Brasher (2006) and Baird (2005).

it is surprising that finance literature has not paid any attention. Hence, in this paper I fill this void by investigating its effects on the U.S syndicated loan market.

In subcon technique, company assets are pooled and existing subsidiary guarantees (i.e, structural seniorities) are eliminated. With guarantees removed, claims are distributed *pari passu* (on an equal footing) among all unsecured claims. Hence, senior unsecured creditors such as banks, which generally require subsidiary guarantees in order to make loans[2], may be exposed to huge recovery shocks. To illustrate, let's exemplify a simplified version of Owens Corning bankruptcy case, which will be explained in detail in Section 2.1.2. Owens Corning has $4 billion unsecured bonds and $2 billion senior unsecured bank loans. As typical in syndicate loans, banks are provided subsidiary guarantees for payment default. When Owens Cornings files bankruptcy, it has $1 billion of assets in parent level and $2 billion in its subsidiaries. Since banks have subsidiary guarantees and subsidiaries have sufficient assets to pay back the loans, banks should get $2 billion. However, if the judge approves subcon technique, then assets are pooled, guarantees are removed and banks get only $1 billion. Hence, just in a single case, a judge's decision can dilute the banks' claim in the amount of $1billion.

Even though in practice creditors are exposed to unanticipated huge recovery shocks, still there does not exist any specific U.S Code provision that would provide the judges a coherent theoretical framework to base their decisions[3]. As this procedure may unfairly disregard the existing contracts, official court opinions refers substantive consolidation as an "extreme and

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[2]S&P (2011) pg. 26

[3]In court opinions, subcon is derived from Bankruptcy Court's general equitable powers as set forth in both §105 of the Bankruptcy code, which authorizes the court to "issue any order, process, or judgment that is necessary or appropriate to carry out the provisions" and also from section 1123(a)(5)(C).

unusual remedy" (In re Gandy, 299 F.3d 489, 499 (5th Cir. 2002)) and suggest for it to be used "rarely"[4]. Despite such official statements, approximately half of the public or large private bankruptcies are executed in the shadow of substantive consolidation. Moreover, the uncertainty survives today as seen in the recent Lehman Brothers' Bankruptcy.[5]

Given the uncertainty regarding subcon, I explore how the threat to creditors effects the lending behavior of banks in the U.S syndicated loan market. Primarily, I focus on the collateral and covenants requirements, which are a contract's essential parts that can severely affect the future operations and restructuring of a company. For example, a secured loan, in which the borrower pledges company assets as collateral, decreases the lender's incentive to renegotiate the loans when the borrower is in financial distress. Moreover, after borrowing secured loans, there may not be sufficient collateral to pledge for the future ones. Hence, company may have difficulty in raising additional backing because the new debt is subordinated to existing secured loans. In addition to collateral requirement, financial covenants have also real effects on corporate policies. As documented in Chava and Roberts (2008) and Nini and Sufi (2009), covenant violations play an important role in corporate governance and capital structure.[6]

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[4]Kheel, 369 F.2d at 847 ("The power to consolidate should be used sparingly because of the possibility of unfair treatment of creditors of a corporate debtor who have dealt solely with that debtor without knowledge of its interrelationship with others.") Eastgroup Props. v. S. Motel Ass'n, Ltd., 935 F.2d 245, 248 (11th Cir. 1991) (noting substantive consolidation should be used "sparingly"); Brief for Respondent at 9, McMonagle v. Credit Suisse First Boston, 126 S. Ct. 1910 (2006) (Nos. 05-827, 05-941) ("because substantive consolidation is extreme and imprecise, this "rough justice" remedy should be rare and one of last resort after considering and rejecting more precise remedies conferred by the Bankruptcy Code")

[5] http://www.ft.com/intl/cms/s/0/bc9ff0e2-1f47-11e0-8c1c-00144feab49a.html#axzz2CRemsgiv

[6] Chava and Roberts (2008) and Nini and Sufi (2009) show that after violations, companies sharply decrease capital expenditures. Moreover, Nini and Sufi (2012) find evidences that after violation, creditors play an active role in corporate governance of the company. Nini and Sufi (2012) find that violations are followed immediately by a decline in acquisitions and capital expenditures, a sharp reduction in leverage and shareholder payout, and an increase in CEO turnover.

In the first hypothesis, I investigate whether after exposure to subcon, a lender transmits this shock to its other clients by writing secured loans more frequently. The main rational is that subcon affects senior creditors only if the loans are granted on an unsecured basis. According to U.S. bankruptcy law, secured creditors are entitled to receive the entire amount of their secured claim, the portion the claim that is backed by collateral, before any unsecured claims are paid. Therefore, secured creditors are not affected by this bankruptcy technique.

To test the first hypothesis, I use borrower fixed effects to control for time-invariant borrower characteristics and time fixed effects to control for macroeconomic factors. Moreover, I also control for bank capitalization since depletion or increase of capital can affect bank's loan portfolio composition. Hence, ruling out borrower side risk, economy wide factors or bank capital explanations, I test whether subcon is important for lender's demand for collateral. I find that one standard deviation change of lender's subcon exposure ratio, number of past subcon bankruptcies to total bankruptcies, increases the probability of the lender's new loan being a secured one approximately 9.2%. As a robustness test, I remove borrower fixed effect since it requires the borrower to have at least 2 observations in the sample to be included. However, the results are similar to fixed effect specification.

Although banks would like to grant every loan on secured basis *ceteris paribus*, it is not possible to back each loan by a collateral since there might not exist sufficient collateralizable assets. Moreover, the borrower may strictly prefer to get an unsecured loan since it may not want to lose its option to get easy financing in the future. Therefore, in the second part of the first hypothesis, I examine whether increase in subcon exposure prompt the lender to demand higher interest rate in new unsecured loans controlling for the company risk. I find

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that one standard deviation change of lender's subcon exposure ratio, number of past subcon bankruptcies to total bankruptcies, increases the unsecured loan interest rate 11 basis points. As a robustness test, I investigate whether subcon exposure cause banks to demand higher interest for secured loans. Consistent with our expectations, there is not significant interest change for the secured loans, strengthening the argument that interest rate change is caused by subcon exposure.

In the second hypothesis, I investigate whether uncertainties regarding subcon cause lenders to change the tightness of the covenants they write. Without exposure to subcon, banks may tolerate the extra usage of junior credits, trusting the higher priority of their claims if the debtor should go bankrupt. However, when judges decide to use subcon, unsecured senior bank loans may receive the same recovery as junior debt. Hence, the shock of such an experience may reduce banks' tolerance to extra junior debt and this can have an effect on financial covenants.

For the second hypothesis, controlling for borrower and time fixed effects, I expect an increase in the covenant tightness of unsecured loans by an increase in exposure of the lenders to subcon. However, I do not expect any change in the strictness of the covenants for secured loans because they are not affected by subcon. My results show that for unsecured loans, at the median contract strictness level, one standard deviation increase in subcon exposure ratio, increases the probability of lender control in a year from 31.45% to 36.01%. The effects, however, are more dramatic if we consider firms for which violations are less common. A firm in the 10th percentile of contract strictness has close to zero probability of violation in the first year. After the effect of a one standard deviation increase in subcon

exposure, the probability of a violation increases to 6.1% in the first year and to 11.9% in the second year. As covenant violations have been shown to reduce investment on the order of magnitude of 1% of capital (Chava and Roberts (2008)) and reduce annual debt issuance by 2.5% of assets (Roberts and Sufi (2009), the increased probability of a violation should be considered material to the firm's financing decisions. As a robustness test, I investigate whether subcon exposure has any effect on the covenant tightness for the secured loans. In line with our expectations, for a secured loan, subcon exposure does not have any effect on covenant strictness. After having these results, next I explore the main channels in the light of existing theories. Rational arguments would suggest that at the onset of heating of judical debates, all lenders would react to subcon news, yielding a time series increase in the collateral demand. Consistent with this hypothesis, I find evidence that there is an increasing lenders' collateral demand starting in 2003[7] , the year Worldcom bankruptcy demonstrated the dark side of subcon to creditors. In this highly debated bankruptcy case, some claims amounting to $750 million received only %44 recovery while they should have got full recovery of 113% (representing principal and post-petition interest) without subcon. The unexpected shock to these creditors appeared in media[8] and was harshly criticized among law scholars[9]. According to practitioners[10], a lot of facts that were cited to support for subcon

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[7]In 2003, another Mega bankruptcy that subcon was the main focus of the debate was the Kmart case. Subcon diluted the unsecured bank loan recovery and increased the junior bond recovery. The issue was also explicitly stated in Kmart's SEC filings: "substantive consolidation would harm the banks in violation of one of the key requirements that substantive consolidation be in the best interest of all creditors... because if the Kmart entities were substantively consolidated, the Subsidiary Guarantees would be eliminated... and [the bank's] anticipated recovery on that single claim would be diluted by the claims of all other unsecured creditors" January 24, 2003, 8-K reports.

[8]http://www.nytimes.com/2003/05/02/business/mci-investors-learn-promises-can-be-broken.html

[9]Baird (2005) states: "...the court might have been able to do more than simply throw up his hands."

[10]http://metropolitancorporatecounsel.com/articles/4030/worldcom-mci-and-second-circuits-substantive-consolidation-doctrine-asserting-creditor

in WorldCom bankruptcy are present also in many corporations and has implications in the subsequent cases.

Even though one should expect a time series shift in collateral demand in aggregate, different reactions in the cross section of the lenders is not very obvious. If each lender is observing these bankruptcies, then why are lenders behaving differently? The main reason may stem from the complexity of a judicial process. When judges write their opinions in a case, they evaluate and cite the decisions in the preceding cases to be consistent with the underlying law. However, corporations are too complex to exactly match one single case to another. For example, in WorldCom, in a single month more than 600,000 transactions took place. Millions of transactions were flawed through interliability accounts, totaling one trillion dollars[11]. Since a lender may be using similar contracts to each of its clients, a recent exposure may prompt a lender to update its expectation for future exposure more pessimistically compared to its peers. Additionally, the results may partly be attributed to asymmetric information between the lenders. Even though, theoretically, bankruptcy documents are publicly available, the details of each case are not written into bankruptcy filings and remain as unpublished. Therefore, a lender may learn better from its own exposure. Alternatively, the results may be explained in a behavioral framework. A recent subcon exposure may lead a loan officer to refrain from future exposure by changing the terms of the contracts.

To make solid arguments for the validity of these results and explanations, it is essential to alleviate the endogeneity concerns. Unobservable variables that are driving a bank to be

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[11](In re WorldCom 2003 WL 23861928, at* 11)

exposed to shock might also be driving the bank to change the way it lends on the loan market. One of the unique aspects of subcon that helps us to challenge the endogeneity problem is the consensus in both legal scholars and practitioners on the unpredictability of the usage of the doctrine. For example, Widen (2006) writes, "I hope to convince you that [substantive consolidation] is the most important doctrine in corporate reorganization. Each year the allocation of billions of dollars among competing creditor groups turns on decisions by courts to approve or reject use of the doctrine... To date, however, no such clear formulation exists; the current state of substantive consolidation doctrine is a mess, leaving courts and reorganization participants adrift". Sprayregen and Friedland (2005) further notes, "Substantive consolidation jurisprudence, perhaps more than many other areas of bankruptcy law, is highly *unpredictable*" and Brasher (2006) writes, "Despite several attempts to craft a coherent doctrine at the appellate level, however, bankruptcy courts continue to apply substantive consolidation without a coherent theoretical framework".[12]

Even though there is consensus regarding the unpredictability of subcon, endogeneity concerns may also be based on different grounds. One alternative explanation to my findings may be that if companies are able to select their judges, who may have personal biases, then my experiments may suffer from endogeneity problem. Indeed, focusing on some specific Chapter 11 motions, Chang and Schoar (2013) find evidences that there are differences among judges to grant or deny some motions. However, their findings do not cast doubt on

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[12]Brasher (2006) also notes, "This lack of theoretical coherence makes courts hesitant to order substantive consolidation under the best of facts and leads to irregularity when they do". Finally, Baird (2005) states, "Nevertheless, a statutory basis for the doctrine is hard to find, and the lower court practice is often at odds with the doctrine as spelled out in appellate court opinions". Pepper Hamilton Law Firm: "Substantive Consolidation: The Uncertainty Continues" `http://www.pepperlaw.com/publications_article.aspx?articlekey=691`. Archer & Greiner Law Firm: "The effect upon debtors and creditors can be far-reaching and unanticipated". `www.archerlaw.com/files/articles/CL%20PACKMAN%203.6.06.pdf`

my results for several reasons. As discussed in detail in Chang and Schoar (2013), judges are randomly assigned to cases within the district[13]. Hence, even if some judges have personal biases, the bankrupt firm do not know which judge will be in charge of the case. Another alternative story to my findings may be about the choice of a court to file bankruptcy. If some circuits apply this technique more often than other circuits, then companies may be selecting specific forums. Considering the fact that judges are randomly assigned, the relevant selection variable should be the ratio of subcon cases to total bankruptcy cases in that circuit. Most cases are filed in Delaware and NY courts. My sample shows that 60% of the Delaware Courts, 55% of the NY courts and 54% of the other court cases were subcon cases. Hence, there does not seem to exist significant differences among the circuits about the application frequency of subcon. These results are also consistent with the theoretical arguments of Stratton (2007), who say that the most popular forums Deleware and NY courts use "essentially identical" tests for subcon. To further mitigate the endogeneity concerns, I investigate whether various bank characteristics such as bank capital ratios, capitalization or Non-Performing loan ratios have statistical power to predict banks' subcon exposure or firms choosing a circuit to file bankruptcy. However, each of these variables are insignificant, fostering the arguments in law literature that subcon is quite unpredictable. For all of the above reasons, I believe that my experiments do not suffer from endogeneity problem.

This study makes several contributions to the literature. To my knowledge, this is the first paper to show that uncertainties in U.S bankruptcy procedures provide an important friction

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[13]Federal Judical Center: "Most district and bankruptcy courts use random assignment, which helps to ensure a fair distribution of cases and also prevents "judge shopping," or parties' attempts to have their cases heard by the judge who they believe will act most favorably"

and affect syndicated loan markets. The results are interesting because US bankruptcy procedures are known to be highly efficient and inspirational to the rest of the world. Smith and Stromberg (2005) explain that the United Kingdom, Japan, Germany, France and Sweden have all instituted more debtor-friendly, U.S.-styled reorganization codes in their bankruptcy laws. Hence, my results show that some important frictions remain even in probably the most efficient bankruptcy system. Furthermore, my paper complements the previous literature on determinants of equilibrium contracts by providing a new channel. My findings show that these frictions play a significant role in explaining a loan's collateral requirement, interest rate and covenant strictness. Considering that some firms do not have sufficient assets to pledge as collateral because they have already been pledged in their existing debt, many financially constrained firms may have difficulty in creating new liquidity. This is particularly important for policy makers who want to ease bank lending standards during a financial crisis.

The remainder of this article is organized as follows. In Section 2, I provide an overview of substantive consolidation by presenting a bankruptcy case to explain how the subcon technique can have a detrimental effect on bank loan recoveries. In Section 3, I describe the data sources. In section 4, I discuss the results of the empirical analysis for each hypothesis. Finally, Section 5 provides a summary and conclusion.

## 2.1 Background on Substantive Consolidation

### 2.1.1 Substantive Consolidation

Substantive consolidation has been one of the most debated bankruptcy issues over the last decade. It derives from the Bankruptcy Court's general equitable powers as set forth in both section 105 of the Bankruptcy code, which authorizes the court to "issue any order, process, or judgment that is necessary or appropriate to carry out the provisions" and also from section 1123(a)(5)(C) of U.S.C. In this technique, the assets of the bankrupt company are pooled, all interliability agreements eliminated and the third party liabilities satisfied from the asset pool. With the removal of the interliability agreements, unsecured senior creditors, who require subsidiary guarantees to grant the loan, receive a lower recovery than expected. In contrast, unsecured junior creditors such as trade creditors or junior bond holders receive a higher one. Unsecured syndicated bank loans, typically the highest seniority claims, usually require interliability agreements to provide loans (S&P (2011)). Hence, a judge's decision to use subcon may have a detrimental effect on the recovery of unsecured bank loans.

In the next subsection, I will present a bankruptcy case, Owens Corning, as an example to explain in detail how subcon can affect the recovery of unsecured bank loans. In the case, a judge's "yes" or "no" decision affected the recovery for banks at the order of $1billion. In this bankruptcy, district court decision was reversed by a court of appeals decision. Hence, this case is also a good example to demonstrate the controversies between the lower and upper court decisions regarding subcon[14].

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[14]Baird (2005) says, "[about subcon] a statutory basis for the doctrine is hard to find, and the lower court practice is often at odds with the doctrine as spelled out in appellate court opinions."

## 2.1.2 An Example Case: Owens Corning Bankruptcy

In 1997, Owens Corning had access to $2 billion in unsecured syndicate loans, of which Credit Suisse First Boston was the lead arranger. As typical in other unsecured syndicate bank loans, Owens Corning was required to provide subsidiary guarantees that gave the banks structural seniority and direct claims against the guarantors for payment default. This structural seniority was crucial because the banks viewed such guarantees as credit enhancements, without which Owens Corning would not have been granted the loans. In 2000, huge asbestos liabilities caused Owens Corning and seventeen of its subsidiaries to file for Chapter 11 bankruptcy in Delaware. As part of the reorganization plan, the debtors proposed "deemed consolidation" to restructure the company. Deemed consolidation is the same as substantive consolidation in terms of creditor distribution and voting rights. The only difference is that in deemed consolidation the legal entities are not actually combined for legal and tax purposes. Since our interest is distribution to creditors, I will use the terms "deemed consolidation" and "substantive consolidation" interchangeably.

Figure 2.1 shows a simplified version of the situation in the Owens Corning bankruptcy case as reported in Widen (2008). In this representation, Subsidiaries 1 and 2 stand for the significant assets that provided the guarantees for the loans. Subsidiary 3 represents a group of nonsignificant subsidiaries, valued at less than $30 million, which did not provide guarantees. Although the bank loans were written at the parent level, the banks had claims to both Subsidiaries 1 and 2 because they provided guarantees. Hence, the effective lender claims in those subsidiaries were also $2 billion. The noteholders had claims only on the parent company at a value of $4 billion. The last row shows the consolidated values for the

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company assets and creditor claims.

These subsidiary guarantees were important for the banks. First, they protected the bank loans against structural subordination. By them, no other future creditor could be granted structural priority over the bank loans. Second, they provided the banks with structural priority over the noteholders, who had claims only on the parent company. Thus, without substantive consolidation, the banks would have had access to the assets of Subsidiaries 1 and 2, and would have been paid in full before any money was given to the noteholders. The total bank loans were $2 billion and Subsidiaries 1 and 2 were worth that, so without substantive consolidation, the banks would have received $2 billion, or 100% recovery.

However, allocations can change dramatically if the judge approves the technique. The effect of deemed consolidation was that it removed the subsidiary guarantees of the 1997 Credit Agreement, rendering the banks' claims pari passu (on an equal footing) with the unsecured claims of the noteholders. As seen in the last column of Figure 2.1, the consolidated assets of the company to be shared among the creditors were $3 billion, while the noteholder claims were $4 billion and the bank loans $2 billion. In this scenario, the claims were to be shared in amounts proportional to the respective creditors' claims, i.e., $2 billion to the noteholders and $1 billion to the banks, reducing the banks' recovery to 50%. Hence, the judge's decision on substantive consolidation change the banks' recovery by $1 billion.

In the first round of the case, the Delaware District Court granted the plan proponents' motion for deemed substantive consolidation over the banks' objections. In support of its order, the bankruptcy court had concluded that[15]: (i) There was substantial identity between

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[15] In re Owens Corning, 316 B.R. 168, 171-172 (Bank. D.Del. 2004).

Owens Corning and its subsidiaries; (ii) the banks did not rely on the separate credit of the subsidiaries; (iii) consolidation would simplify and expedite completion of the reorganization; and (iv) it would be exceedingly difficult to untangle the financial affairs of the various entities.

After the Delaware District Court opinion, the banks appealed to the upper court. The Third Circuit Court of Appeals set forth five principles for substantive consolidation to be advanced: (i) limiting the cross-creep of liability by respecting entity separateness is a fundamental ground rule; (ii) the harms substantive consolidation addresses are nearly always those caused by debtors; (iii) mere benefit of administration of the case is hardly a harm calling substantive consolidation into play; (iv) substantive consolidation should be a rare remedy and one of last resort after considering and rejecting other remedies; and (v) while substantive consolidation may be used defensively to remedy the identifiable harms caused by entangled affairs, it may not be used offensively. Based on these principles, the court held that, in the Third Circuit, what must be proven is that (a) pre-bankruptcy, the entities to be consolidated "disregarded separateness so significantly that their creditors relied on the breakdown of entity borders and treated them as one legal entity"; or (b) after filing for bankruptcy, the entities' assets and liabilities "are so scrambled that separating them is prohibitive and hurts all creditors". Applying this test to the facts in Owens Corning, the court found that substantive consolidation was not appropriate in that case.[16]

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[16]In re Owens Corning, 2005 WL 1939796 (3d Cir. Aug. 15, 2005), reversing 316 B.R. 168 (Bankr. D. Del. 2004).

## 2.2   Data and Summary Statistics

In this section, I first briefly describe my data sources. Then I provide summary statistics regarding lenders, borrowers, syndicated loan facilities and substantive consolidation cases.

### 2.2.1   Data Sources

This study uses various data sources. Below I summarize the content of each data source, explain the relevant filters and detail how I exploit them for my analysis. The data sources that I use are: LPC DealScan, Compustat, S&P Capital IQ, Widen Substantive Consolidation Database, Lopucki Bankruptcy Research Database ("BRD"), PACER (B-4 reports) and SEC filings.

### 2.2.2   Loan Level Data

In a typical syndicate loan, lead arrangers initiate the loans and negotiate the contractual terms with the company. Then lead arrangers sell some portion of the loans to other banks or institutions, which are called participants. These are passive investors who leave the loan monitoring to the lead arrangers. In syndications, companies typically borrow different types of facilities such as credit lines or term loans as parts of a loan package. The covenants for these loans are determined for the whole package, i.e., they are not defined at the facility level.

In this paper, I use the Thomson Reuters Loan Pricing Corporation's (LPC) DealScan database for the loan-level data. DealScan covers loan details from syndicated and bilateral loans collected by staff reporters from lead arrangers and SEC filings. The database includes

detailed information, at both the facility and package levels, about the amount, start and end dates, covenants and lead arrangers. Since the lead arrangers are responsible for monitoring the loan and they keep the highest fraction, all of my analysis is based on lead arrangers. I classify a lender as a lead arrangers if its "LeadArrangerCredit" field indicates "Yes". If no lead arranger is identified using this approach, I accept the ones whose "LenderRole" fall into the following fields: lead arranger, lead bank, lead manager, mandated arranger, administrative agent, agent, arranger, bookrunner, coordinating arranger, or mandated lead arranger.

I restrict my sample to dollar-based loans in the 2000-2006 period since my subcon data covers only 2000-2005 bankruptcies. I drop financial companies (SIC 6000-6009) and also eliminate companies with missing or negative assets or sales. After this filtering, I merge my sample with accounting data available from Compustat, using a link file provided by Michael Roberts (as used in Chava and Roberts (2008)). Table 2.1 Panel A shows the summary statistics for the LPC Dealscan-Compustat sample. I have 14,178 packages with a mean loan amount of $544 million. The average maturity for the loans is 45 months, and approximately 70% of these loans are secured. The borrowing companies have a mean asset value of $5.6 billion and leverage ratio of 33.5%. The mean values of EBITDA/Assets and Current Ratio are 10.9% and 1.739, respectively. Around half of the sample have an S&P long-term credit rating. I assign numerical values to these ratings from 1(AAA) to 26(D). The median company in my sample has a credit score of 10, equivalent to that of BBB.

In my experiments, one of the dependent variables is the collateral requirement. LPC Dealscan has a secured field that indicates whether the borrower has pledged any collateral

to the lenders. However, for approximately half of the facilities, this field is empty. Since this is my dependent variable and I am using logit regression with borrower fixed effects, I need to have enough data and variation for a reasonable experiment. Therefore, I hand collect this data from SEC filings and merge them with the existing data.

For the contract strictness part, I merge my sample with the LPC lender and covenant databases. Through this step, I obtain information about borrower characteristics, the lender's name and loan covenants at the package level. Using the lender's name, I gather ultimate parent-level accounting data from Federal Reserve's Y-9C database for U.S. banks and from Capital IQ for non-U.S. banks. In my sample, I require loans to be led by lenders who were exposed to at least one bankruptcy case with unsecured loans to the borrower. The rationale is that lenders without bankruptcy experience could be very different than those with it, in unobservable characteristics that could add bias to my results. However, it is worth noting that the vast majority of lenders had at least one bankruptcy during the sample period. Table2.1 Panel B shows the summary statistics for the merged sample. After eliminating packages with missing loan amount and maturity, I get 2,148 packages. In this sample, the average loan amount is $1.09 billion and the mean loan maturity is 42 months. The loan amounts seem to be larger than the original sample. One explanation may be that LPC had lender information for bigger loans. In this new sample, borrowers have a mean asset value of $6.5 billion, leverage ratio of 0.27%, EBITDA/Asset of 12.7% and current ratio of 1.77. Hence, the borrower characteristics are similar to those of the LPC Dealscan-Compustat sample.

In this new sample, I identify the lender information for 1,415 of the packages. The

mean value of the total lender assets is \$675 billion. The average lender capitalization is 7.02%. Concerning the lender performance measures, the mean values for Non-Performing Loans/Total Loans and Non-Performing Loans/Total Assets are 1.32% and 0.55%, respectively. The average values for Tier 1 Capital Ratio and Total Capital Ratio are 8.64% and 12.27%.

LPC Dealscan provide detailed information about the type and initial ratio or amount of the covenants. For the strictness measure, I follow Murfin (forth.) and use the following covenants: minimum EBITDA/debt, current ratio, quick ratio, tangible net worth, total net worth, EBITDA, fixed-charge coverage, interest coverage, maximum debt/equity, debt/tangible net worth, capital expenditure and leverage ratio. These cover the vast majority of the Dealscan database. The average contract strictness in my sample is 16.63% with a median strictness of 9.01%.

## 2.2.3 Bankruptcy Data

For substantive consolidation, I use the Subcon Database, which was provided through the generosity of Prof. Widen of the University of Miami Law School. This database investigate the 2000-2005 bankruptcies that are covered in the Lopucki Bankruptcy Research Database (BRD)[17]. BRD has detailed information about bankruptcy cases, including the pre-bankruptcy accounting information, judicial district, judge name, emerging information and gvkey. For this period, BRD lists a total of 367 bankruptcy cases. The Widen Subcon

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[17]The BRD contains data on all large, public company bankruptcy cases filed in the United States Bankruptcy Courts from October 1, 1979 to present. A case is classified as "large" if debtor reported assets or more than \$100 million (measured in 1980 dollars) on the last form 10-K that the debtor filed with the Securities Exchange Commission before filing the bankruptcy case.

Database gather information from the original source material (such as confirmation orders, disclosure statements and reorganization plans) for 315 of these cases using PACER and supplemented it with some material obtained from private law firms and SEC filings[18]. Each of these 315 cases are classified as either subcon or non-subcon.

As described in Widen (2006), in this classification, a case is considered as subcon case if it was the federal bankruptcy case of a large, public company in which either (a) a settlement of substantive consolidation litigation preceded approval of a reorganization plan or liquidation or (b) a plan of reorganization or liquidation proposed substantive consolidation of two or more entities involved in related bankruptcy proceedings. For the purposes of this classification, substantive consolidation was considered part of a bankruptcy plan or liquidation if the plan or liquidation provided (i) for the actual combination of two or more legal entities, (ii) for voting on the plan as if two or more entities were a single entity (whether or not the plan combined the entities) or (iii) for distributions as if two or more entities were combined (whether or not the plan combines the entities). If a debtor proposed that two or more entities be consolidated prior to implementation of a plan, substantive consolidation was considered part of the subsequent plan. In this database, "deemed consolidation", the use of substantive consolidation doctrine to justify consolidated distributions and voting without actual combination of legal entities, is denoted as "substantive consolidation". Since, my experiment focused on the distributions to the lenders, this classification is in line with my research question.

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[18]PACER stands for Public Access to Court Electronic Records. It is an electronic public access service that allows users to obtain case and docket information from federal appellate, district and bankruptcy courts for a fee.

## 2.3 Empirical Methodology

In this section, I present the details of the experiment for each hypothesis. However, as a first step, I investigate whether some observable lender characteristics are related to subcon exposure. This is important because it is possible that lenders with some ratios such as high capitalization or low Non-Performing Loan/Total Assets are "good" lenders and not vulnerable to shocks. If this is the case, then my experiment might capture some lender-specific variables. Table 2.2 shows the logit regression, where the dependent variable is subcon exposure of the bankrupt loan and the independent variables are various bank characteristics including Lender Assets, Lender Capitalization, Tier1-Capital Ratio, Total Capital Ratio, Non-Performing Loans/Total Assets, Non-Performing Loans/Total Loans and Non-Performing Assets/Total Assets. The regression results show that none of the observable bank characteristics are related to subcon exposure. The results support the claim that it is difficult to predict the borrower's subcon exposure.

Moreover, in Figure 2.2, I investigate visually whether patterns exist in which a group of lenders can systematically escape from exposure. If subcon is unpredictable and has a probability of 0.57 (mean value), then I would expect that with the increase in the number of bankruptcies, $SubconRatio$ (Total number of subcon bankruptcies/Total number of bankruptcies) would be close to 0.57. Similarly, the lenders that have a $SubconRatio$ of 0 or 1 should have fewer bankruptcies. Figure2.2 shows that the lenders with the highest number of bankruptcies have Subcon Ratios close to 0.6 and the lenders in the extremes have fewer than 5 bankruptcies. Hence, this figure also supports the claim that it is difficult to predict

the borrower's subcon exposure.

## 2.3.1 Hypothesis-1

**Hypothesis 1a:**

*"In the meantime, banks are considering what the decision [substantive consolidation] means for the way they lend money. Some lenders are already becoming more conservative about extending unsecured loans with guarantees, according to lawyers."*

**Financial Times, January 14, 2005, "On Wall St: Ruling Raises Alarm"**

In the first hypothesis about collateral requirement, I have two predictions. In the first one, I am testing whether banks' exposure to subcon causes them to write secured credit more often. In the second one (Hypothesis 1b), I am testing whether an increase in subcon exposure makes banks demand higher interest rates for their new unsecured loans, but not for new secured ones.

To test the first prediction, I use the specification in (2.1), in which $SECURED$ is a binary variable denoting whether the bank loan is secured. $SubConRatio$ is (Total number of subcon bankruptcies)/(Total number of bankruptcies), and its calculation will be explained in detail below. $Y$ represents various control variables such as the Z-Score, Credit Rating, Loan Amount and Tangibility. $BankCap$ is the capitalization of the bank. $i$, $l$ and $t$ are the borrower index, lender index and time index consecutively.

$$SECURED_{i,t} = \alpha_i + \gamma_t + \varphi SubConRatio_{l,t-1} + \psi Y_{i,t} + \rho BankCap_{l,t-1} + \varepsilon_{i,t} \qquad (2.1)$$

To gauge the bank's subcon exposure, first, I merge all of the bankruptcies from the 2000-2005 period of the BRD database with LPC Dealscan using the link file provided by Michael Roberts (as used in Chava and Roberts (2008)). I use this period because the Widen Subcon Database have information only for this period. Then, using the lender information, I extract the names and "ultimateparentid" of the banks who have unsecured existing credits to these bankrupt companies. Hence, for each point in time and for each lender, I have the exposure for the total number of unsecured bankruptcy exposure. In the next step, I merge this dataset with the Widen Subcon Database to determine which ones are subcon cases. I call the ratio of subcon cases to total bankruptcies, Subcon Ratio. Thus, if a bank has 4 bankruptcies in total and 3 of them are subcon cases, then its $SubconRatio$ would be 0.75. It is particular importance to note that $SubconRatio$ is a time-varying parameter for each lender and the regressions use the ratio at the time of package initialization.

One problem in the calculation of the $SubconRatio$ is that some of the lenders did not have bankruptcies during the sample period. Bankruptcy may be the result of poor monitoring, and the lenders with at least one bankruptcy may be different than lenders without any. Since I want to examine the differential effect of $SubconRatio$ across similar banks, I require the lenders to have at least one bankruptcy (subcon or not). However, the vast majority of lenders in LPC Dealscan had at least one bankruptcy during that period.

Another important factor that may affect the collateral requirement is bank capitalization. The sign of coefficient in bank capitalization change is unclear though. The depletion of bank capital may cause banks to make lending less risky by writing more secured credits. In contrast, banks may start gambling and write more unsecured credits. Hence, experiment

also illuminates the banks' reactions to the change in their capitalization.

In specification (2.1), there are several important things to consider. First, I use borrower fixed effects to account for time-invariant company risk. Hence, fixing the borrower risk, I test whether a bank's recent subcon experience with previous loans yields a higher probability of writing a secured loan in its subsequent loan origination. We can illustrate this regression with an example: Company A borrows an unsecured loan in 2002 with a maturity of 3 years. In 2005, *the same company* (Company A) wanted a new loan. I test whether lender exposure to subcon in this period would result in the new loan being secured.

Another issue to consider in this regression is the presence of both time-series and cross sectional heterogeneity. This is important because some banks may learn from other banks' experiences, and the trend may pertain only to the time-series. To alleviate these concerns, I include time fixed effects and observe the lending behavior change with respect to a bank's exposure to shocks.

Table2.3 shows the regression results for the specification in (2.1). The variable of interest *SubConRatio* has a positive sign and is significant at 1% level in all regressions. Economically, it means that one standard deviation change (19.39) around the mean (57.22), increases the probability of the loan being secured approximately 9.2% controlling for borrower risk. In this specification, the Z-score (which increases as borrower risk is reduced) generally has a negative sign and shows that risky borrowers generally pledge collateral to receive the loan.

Even though using borrower fixed effects can control time-invariant borrower characteristics and provide a clean experiment, it requires the borrower to be in the sample at least twice. Moreover, since regression uses variation in the dependent variable, at least one of

these loans should be secured and one of them should be unsecured. These requirements decrease the sample size drastically. Therefore, I run the same regression specified in (2.1) without using borrower fixed effects. Table 2.4 shows the results. $SubConRatio$ has a positive sign and is significant at 1% level in all regressions. As in Table2.3, the Z-score (which increases as borrower risk is reduced) has a negative sign and is significant at the 1% level, confirming that risky borrowers pledge collateral to receive the loan. In all of the regressions, lender capitalization has a negative sign and in some specifications statistically significant. Hence, depletion of bank capital induces the lenders to take less risk instead of more. This result is consistent with Murfin (forth.) findings.

**Hypothesis 1b:**

In the second part of Hypothesis1, I test whether an increase in subcon exposure causes a lender to increase the interest rate for its new unsecured loans. In my experimental design, I employ the regression equation in (2.2). In this specification, $InterestRate$ is the basis points over LIBOR for each facility. $SubConRatio$ represents (Total number of subcon bankruptcies)/(Total number of bankruptcies) as defined in Hypothesis1a. $Unsecured$ is a binary variable with a value of 1 if the bank loan is unsecured . $SubConRatio_{l,t-1} \times Unsecured$ is the interaction of $SubconRatio$ with $Unsecured$. Decrease in the lender capitalization in the last quarter is $\Delta LenderCap_t$. $Y$ represents the various control variables such as Z-Score, Credit Rating, Loan Amount, Maturity and Tangibility. $i$, $l$ and $t$ are the borrower index, lender index and time index respectively.

$$InterestRate_{i,t} = \alpha_i + \gamma_t + \varphi(SubConRatio_{l,t-1} \times Unsecured) \tag{2.2}$$

$$+ \lambda(SubConRatio_{l,t-1}) + \rho(Unsecured)$$

$$+ \psi(\Delta LenderCap_t) + \mu Y_{i,t} + \varepsilon_{i,t}$$

Many factors can affect the interest rates. One of these is the borrower's riskiness. In specification (2.2), $\alpha_i$ is borrower fixed effects and controls for the time-invariant risk characteristics. Moreover, I include S&P long-term credit ratings and Altman Z-Score to account for the borrower risk. Interest rates can also be affected by the supply of capital in the market. $\Delta LenderCap_t$ captures lender-specific supply and $\gamma_t$, which is time fixed effect, controls for the yearly fluctuations that are caused by macroeconomic factors. Our main interest is the interaction term, $SubConRatio_{l,t-1} \times Unsecured$. I predict that if the exposure of the lender increases and they still lend an unsecured credit, then a higher interest rate would be stipulated. This should produce a positive coefficient for the interaction term. Table 2.5 shows that the interaction term had a positive sign and is significant at the 5% significance level except in the last regression.

## 2.3.2   Hypothesis-2

*"The decision [substantive consolidation] has created "quite a bit of alarm" in the bank lending and investment community, according to the head of syndicated lending at one Wall Street bank. Loan investors clearly thought they were senior to the bonds"*

**Financial Times, January 14, 2005, "On Wall St: Ruling Raises Alarm"**

In this hypothesis, I test whether an increase in subcon exposure causes a lender to write stricter covenants in new unsecured loans. Since secured loans are already protected by collateral and are not affected by subcon, I do not expect any increase in the covenants for them.

For contract strictness, I use the measure developed in Murfin (forth.). This measure summarizes covenant tightness as a probability of the lender's allocating control via covenant violation. The main intuition of the measure is as follows. Consider an $N \times 1$ vector of $r$ financial ratios, which receive $N$-dimensional multivariate normal shocks, converting it to $r'$ as in (2.3). If the covenant for the $i^{th}$ element of r vector is written such that $r'_i < \underline{r_i}$ is a covenant violation, then strictness can be calculated as in (2.4) where $F_N$ is the multivariate CDF with mean 0 and a covariance matrix $\sum$.

$$r' = r + \varepsilon \sim N_N(0, \sum) \tag{2.3}$$

$$STRICTNESS \equiv p = 1 - F_N(r - \underline{r}) \tag{2.4}$$

To calculate the contract strictness, I first merge LPC Dealscan's package-level data with the covenant information to obtain thresholds and types of covenants. Then, I merge my this sample with Compustat for the quarters in which the packages were initiated to obtain the accounting information of the borrowers. Having minimum allowable ratios and accounting

data for the quarters, I calculate the slack as the difference between the minimum allowable ratio and the observed ratio (or the negative of the difference in the case of a maximum ratio) for the following covenants: minimum EBITDA/debt, current ratio, quick ratio, tangible net worth, total net worth, EBITDA, fixed charge coverage, interest coverage, maximum debt/equity, debt/tangible net worth, capital expenditure and leverage ratio.

In the next step, I calculate the covariance matrix for the covenants mentioned in previous paragraph. For all the Compustat firms with non-zero leverage, I calculate logged ratios for each quarter at the 1-digit SIC level. Then, I subtract the lagged ratio from the current ratio to find the change in each quarter. Using rolling ten-year windows of backward-looking data for these changes, I obtain the covariance matrix for each quarter in my sample. With a slack and covariance matrix for the covenants, I calculate the strictness measure for each package as in equation (2.4).

In this experiment, I examine whether $SubConRatio$ has different effects on unsecured vs. secured loans. I predict that it would increase strictness in unsecured loans but not have any effect on the secured loans. To demonstrate this difference, I run several tests. First, I utilize specification (2.5) for secured and unsecured loans separately. Then, I run the regressions for the whole sample as specified in (2.6) and determined whether ($SubconRatio \times Unsecured$) has the predicted sign.

$$STRICTNESS_{i,t} = \alpha_i + \gamma_t + \lambda SubConRatio_{l,t-1} + \beta X_{i,t} + \varepsilon_{i,t} \qquad (2.5)$$

Table 2.6 shows the results of specification (2.5) for unsecured loans only. Our variable of interest, $SubconRatio$, increases the unsecured loan strictness at a 5% significance level.

If we interpret strictness as a the probability of lender's control in the quarter, then using the numbers in Column I of Table 2.6, for the median contract strictness level (9.01), a one standard deviation (19.39) increase in $SubConRatio$ increases the probability of lender control in a year from 31.45% to 36.01%[19]. Chava and Roberts (2008) show that covenant violations reduce investment by approximately 1% capital and Roberts and Sufi (2009) find evidence that covenant violations reduce annual debt issuance by 2.5% of assets. Hence, my results may be regarded as material to a firm's real and financing decisions.

$$STRICTNESS_{i,t} = \alpha_i + \gamma_t + \varphi(SubconRatio_{i,t-1} \times Unsecured) \qquad (2.6)$$

$$+ \lambda(SubconRatio_{i,t-1}) + \rho(Unsecured)$$

$$+ \psi LenderCap_{l,t} + \eta Y_{i,t} + \varepsilon_{i,t}$$

Table 2.7 shows the results of the same regressions for secured loans. $SubconRatio$ is not significant, which is in line with our expectations. Zscore has a negative sign and is significant at the 10% level. Given that I also controll for S&P credit rating, Zscore seems to have captured the borrower riskiness well. Table 2.8 presents the results for specification (2.6). Our variable of interest is the interaction term, $SubConRatio \times Unsecured$. It is positive and significant at 10% significance level.

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[19]I calculate the probability of a violation until time T as $\sum_{i=1}^{T} p(1-p)^{i-1}$

### 2.3.3 Are Main Findings Consistent with Rational Hypothesis?

Rational arguments would suggest that at the onset of heating of judical debates, all lenders would react to subcon news, yielding a time series increase in the collateral demands. To test this hypothesis, I investigate whether there was an increase in the frequency of initiation of secured loan starting in 2003, the year subcon was at the heart of WorldCom and Kmart's [20] reorganization plans. In WorldCom case, some claims amounting to $750 million received only %44 recovery while they should have got full recovery of 113% (representing principal and post-petition interest) without subcon. The unexpected shock to these creditors appeared in media[21] and was harshly criticized among law scholars[22]. According to practitioners[23], a lot of facts that were cited to support for subcon in WorldCom bankruptcy present also in many multicorporate businesses and has implications in the subsequent cases. In the next section, I briefly discuss how subcon affected the distribution to creditors in WorldCom case.

#### 2.3.3.1 WorldCom Bankruptcy Case

On July 21, 2002, WorldCom filed for Chapter 11 bankruptcy protection as the largest such filing in United States history at the time (since overtaken by the bankruptcies of both Lehman Brothers and Washington Mutual in September 2008) with $41 billion debt load,

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[20]Subcon diluted the unsecured bank loan recovery and increased the junior bond recovery. The issue was also explicitly stated in Kmart's SEC filings: "substantive consolidation would harm the banks in violation of one of the key requirements that substantive consolidation be in the best interest of all creditors...because if the Kmart entities were substantively consolidated, the Subsidiary Guarantees would be eliminated... and [the bank's] anticipated recovery on that single claim would be diluted by the claims of all other unsecured creditors.", January 24, 2003, 8-K reports.

[21]"MCI Investors Learn Promises Can Be Broken", 05/02/2003, New York Times

[22]Baird (2005) states: "...the court might have been able to do more than simply throw up his hands."

[23]http://metropolitancorporatecounsel.com/articles/4030/worldcom-mci-and-second-circuits-substantive-consolidation-doctrine-asserting-creditor

$24 billion of which is in bonds. One of the biggest challenges in the reorganization plan was the subcon decision. Since some of the credits were on the parent level and some were on the subsidiary level, pooling of the assets dramatically changed the priorities and recoveries. The problem was especially severe for a group of investors of MCI, which was acquired by WorldCom on November 4, 1997 for $37 billion, making it the largest corporate merger of US history at that time. After acquisition, MCI became a wholly owned subsidiary of Worldcom.

In 1996, when there was no acquisition news, MCI issued $750 mil. 8% Cumulative Quarterly Income Preferred Securities (QUIPS)[24], which functionally represented subordinated claim against MCI. Additionally, before merger it issued $2.59 billion of senior bonds. From these investors' perspective, as a standalone company MCI was quite promising with strong market power and financial standing. It was the second largest carrier of long-distance telecommunications services in the U.S. and the second largest carrier of international long-distance telecommunications services in the world. Moreover, it had quite financial standing with annual $4 billion EBITDA. After the merger, MCI performed its operations legally as a "separate entity" and continued to be an obligor to QUIPS and bond investors[25].

As MCI is legally a separate entity, WorldCom creditors have no claim on MCI assets

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[24]In re: WorldCom Inc, et al. "MCI issued the QUIPS through a somewhat complex mechanism. First, it created a wholly owned Delaware statutory business trust called MCI Capital I, of which MCI owned all the common stock. MCI Capital I then issued $750 million aggregate principal amount of 8% Cumulative Quarterly Income Preferred Securities – the QUIPS – and used the proceeds to purchase $750 million of 8.00% Junior Subordinated Deferrable Interest Debentures (the "QUIDs") issued by MCI Communications Corp. Thus, the QUID5 were debt instruments of MCI that earn 8% annual interest, payable quarterly but deferrable so long as MCI does not pay dividends. MCI Capital Trust I merely held the QUIDs and distributed the resulting cash flow to the QUIPS holders."

[25]In re: WorldCom Inc, et al., Application of the Dissenting MCI Bondholders Pursuant to 11 U.S.C. Â§ 503(b) For Allowance of Administrative Expenses Incurred in Making A Substantial Contribution in These Chapter 11 Cases. Case No. 02-13533 (AJG)

other than through Worldcom's ownership of the MCI equity. Therefore, MCI creditors were entitled to be paid in full before their shareholder, WorldCom, could receive any value to pay to its creditors. MCI had operating subsidiaries comprising at least 90% of WorldCom's operating value. Hence, it had sufficient assets to pay in full to QUIPS investors and its senior bond holders. Considering the fact that at the time of investment MCI creditors relied on the creditworthiness of MCI, not WorldCom, and that MCI operated always as a legally separate entity after the merger, MCI investors clearly thought that they should get 100% recovery[26]. However, the situation changed when the WorldCom assets were substantive consolidated. Since in this bankruptcy technique assets are pooled, MCI investors were subordinated to WorldCom creditors. At the end of the settlement $750 million QUIPS investors and $2.59 billion MCI senior bond investors received only 44% and 80% recovery respectively while they should have got full recovery of 113% (representing principal and post-petition interest).

### 2.3.3.2 Empirical Testing for Aggregate Movement

In this section, I test whether there was an aggregate reaction in the market to substantive consolidation of WorldCom assets. I hypothesize that if market reacts to this case, then there should be an increasing collateral demand in 2003 and afterwards. Figure2.11 shows the collateralized loan ratio in 1996-2009 period. In the figure, y axis refers to (Total Amount of Secured Loans)/ (Total Amount of Loans) for loans that were originated in US and have information in secured field in LPC Dealscan Database. Consistent with our hypothesis, there is a sharp increase starting with 2003 and the level stays quite persistent in post-2003

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[26] "MCI Investors Learn Promises Can Be Broken", 05/02/2003, New York Times

period. One interesting observation in this figure is the high secured ratio in 1998. This peak may be associated with 1998 Russian financial crisis. Hence, we get some evidence that macroeconomic conditions may also have a role in determining collateral demand in the market.

$$Secured_{i,t} = \alpha Post-WorldCom + \beta_{i,t} Zscore_{i,t} + \delta Tangibility_{i,t} + \phi Log(LenderCap_{i,t}) + \omega Y_{i,t} + \varepsilon_{i,t}$$

$$(2.7)$$

Even though Figure2.11 shows a sharp increase in collateral demand starting in 2003, it may be the case that in our treatment period only risky firms may have got the loans, inflating the secured ratio. Therefore, I use the regression equation (2.7) to formally test that in Post-WorldCom period, there is an increase in collateral demand even we control for the company risk. In this specification, the dependent variable $Secured_{i,t}$ is a binary variable that takes the value 1 if loan is secured and 0 otherwise. $Post-WorldCom$ is a dummy variable indicating whether the package was initialized in 2003 or afterwards. $Y_{i,t}$ refers to various independent variables including firm credit rating, loan maturity and amount. In equation (2.7), our main variable of interest is $\alpha$, which indicates whether there was an aggregate increase in demand in post-WorldCom period. Table2.11 shows the regression results. We see that $\alpha$ is positive and statistically significant at 1% level. Economically it means that at the secured ratio mean level (0.54), a loan has (8%) higher probability to be a secured loan if it was started in 2003 or afterwards.

## 2.4 Conclusion

In this paper, I investigate whether uncertainties in bankruptcy techniques provide an important friction for the syndicated loan market. In my experiment, I use one of the most debated issues in U.S bankruptcy courts, substantive consolidation. In this technique, existing seniorities are eliminated, resulting in large losses for the unsecured bank loans. I show that an increase in the subcon exposure of the lenders affects the loans they will write for their other clients. I find that increases in lender's subcon exposure increase the probability that their new loans will be written on a secured basis. Moreover, if they provide unsecured ones, as compensation they demand higher interest rates and tighter covenants.

This study makes several contributions to the literature. To my knowledge, it is the first paper to show that uncertainties in U.S bankruptcy procedures provide important frictions and affect syndicated loan markets. The results are interesting because US bankruptcy procedures are known to be highly efficient and inspirational to the rest of the world. Smith and Stromberg (2005) explain that the United Kingdom, Japan, Germany, France and Sweden have all instituted more debtor-friendly, U.S.-styled reorganization codes into their bankruptcy laws. My results show that some important frictions still remain in probably the most efficient bankruptcy system. Furthermore, my paper complements the previous literature on determinants of equilibrium contracts by providing a new channel. My findings show that these frictions play a significant role in explaining a loan's collateral requirement, interest rate and covenant strictness. Considering that some firms do not have sufficient assets to pledge as collateral because the assets have already been pledged in the firm's existing

debt, such financially constrained companies may have difficulty in creating new liquidity. This is particularly important for policy makers who want to ease bank lending standards during a financial crisis.

# 2.5 Tables

**Table 2.1:**
**Summary Statistics**

In this table, Panel A presents summary statistics of merged DealScan-Compustat sample at the package level for non-financial companies in 2000-2007 period. Loans that do not have start and end date or maturity were eliminated. Sample include only the packages, which were originated in the United States. Borrowers with missing assets or negative sales information were excluded from the sample. Panel B (in the next page) is the sub-sample for which lead arrangers and covenant information exists.

|  | N | Mean | $10^{th}$pct | $50^{th}$pct | $90^{th}$pct | Std. Dev. |
|---|---|---|---|---|---|---|
| **Panel A: DealScan-Compustat Sample** | | | | | | |
| **Firm Characteristics** | | | | | | |
| Assets ($Bil) | 14,177 | 5.684 | 0.102 | 1.395 | 20.721 | 8.948 |
| Leverage Ratio | 14,177 | 0.335 | 0.064 | 0.300 | 0.595 | 0.259 |
| EBITDA/Assets | 12,446 | 0.109 | 0.029 | 0.116 | 0.216 | 0.183 |
| Current Ratio | 14,177 | 1.739 | 0.709 | 1.381 | 2.938 | 1.885 |
| Zscore | 11,759 | 2.067 | 0.123 | 1.429 | 4.569 | 5.115 |
| S&P Long-Term Debt Rating | 7,946 | 10.36 | 6 | 10 | 15 | 3.65 |
| **Loan Characteristics** | | | | | | |
| Loan Amount ($M) | 14,178 | 544 | 20 | 200 | 1,210 | 1,390 |
| Maturity (months) | 13,504 | 44.98 | 12 | 47 | 73 | 28.44 |
| Secured | 8,836 | 0.70 | 0 | 1 | 1 | 0.45 |

(to be continued in the next page)

In this table, Panel A (in the previous page) presents summary statistics of merged DealScan-Compustat sample at the package level for non-financial companies in 2000-2007 period. Loans that do not have start and end date or maturity were eliminated. Sample include only the packages, which were originated in the United States. Borrowers with missing assets or negative sales information were excluded from the sample. Panel B is the sub-sample of A for which lead arrangers and covenant information exists. *SubconRatio* is a time varying variable for each lender and calculated as the ratio of number of total subcon cases to total number of bankruptcy cases, in which lender's role was lead arranger in the syndication. Definition of other variables were provided in the Appendix.

|  | Panel B: DealScan-Compustat-Covenant Sample(2000-2007) | | | | | |
|---|---|---|---|---|---|---|
|  | N | Mean | $10^{th}$pct | $50^{th}$pct | $90^{th}$pct | Std. Dev. |
| **Lender Characteristics** | | | | | | |
| Subcon Ratio (multiplied by 100) | 1,941 | 57.22 | 33.33 | 57.14 | 75 | 19.39 |
| Total Lender Assets($Mil) | 1,415 | 675.68 | 74.30 | 719.48 | 1,148.44 | 358.46 |
| Lender Capitalization | 1,270 | 7.02% | 4.45% | 6.97% | 9.23% | 1.95% |
| $\frac{Non-PerformingLoans}{TotalLoans}$ | 1,367 | 1.32% | 0.54% | 1.08% | 2.17% | 1.01% |
| $\frac{Non-PerformingLoans}{TotalAssets}$ | 1,367 | 0.55% | 0.21% | 0.43% | 0.91% | 0.50% |
| Tier1 Capital Ratio | 1,365 | 8.64% | 7.51% | 8.31% | 9.65% | 1.50% |
| Total Capital Ratio | 1,365 | 12.27% | 11.04% | 12% | 13.2% | 1.47% |
| **Loan Characteristics** | | | | | | |
| Contract Strictness | 2,031 | 16.63 | 0.003 | 9.01 | 46.17 | 19.71 |
| Loan Amount ($M) | 2,148 | 1,090 | 25 | 450 | 3,000 | 1,790 |
| Maturity (months) | 2,148 | 42.15 | 12 | 48 | 60 | 22.38 |
| Secured | 1,867 | 0.45 | 0 | 0 | 1 | 0.49 |

## Table 2.1: Continued
## Summary Statistics

In this table, Panel A (in the previous page) presents summary statistics of merged DealScan-Compustat sample at the package level for non-financial companies in 2000-2007 period. Loans that do not have start and end date or maturity were eliminated. Sample include only the packages, which were originated in the United States. Borrowers with missing assets or negative sales information were excluded from the sample. Panel B is the sub-sample of A for which lead arrangers and covenant information exists. *SubconRatio* is a time varying variable for each lender and calculated as the ratio of number of total subcon cases to total number of bankruptcy cases, in which lender's role was lead arranger in the syndication. Definition of other variables were provided in the Appendix.

| | N | Mean | $10^{th}$pct | $50^{th}$pct | $90^{th}$pct | Std. Dev. |
|---|---|---|---|---|---|---|
| **Panel B: DealScan-Compustat-Covenant Sample(2000-2007)** | | | | | | |
| **Firm Characteristics** | | | | | | |
| Assets ($Bil) | 2,148 | 6.579 | 0.132 | 2.634 | 22.332 | 8.920 |
| Leverage Ratio | 2,148 | 0.273 | 0.015 | 0.279 | 0.489 | 0.196 |
| EBITDA/Assets | 2,030 | 0.127 | 0.053 | 0.121 | 0.235 | 0.108 |
| Current Ratio | 2,148 | 1.777 | 0.765 | 1.482 | 3.100 | 1.164 |
| Zscore | 1,836 | 2.548 | 0.354 | 1.768 | 5.868 | 3.833 |
| S&P Long-Term Debt Rating | 1,431 | 9.466 | 6 | 9 | 14 | 3.210 |

**Table 2.2:**
**Bank Characteristics for Predicting Subcon**

This table reports logit regressions, where the dependent variable, *Subcon*, takes a value of 1 it was a subcon case. Independent variables are the characteristics of the lenders, who had existing unsecured credit at the time the debtor filed bankruptcy. Definition of the independent variables are provided in the Appendix.

| VARIABLES | Dependent Variable: SUBCON (0-1 Variable) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| Log(Loan Amount) | -0.00991 | | 0.163 | 0.0847 | 0.0525 | 0.118 | -0.0415 | -0.102 | -0.112 | |
| | (-0.01) | | (0.26) | (0.13) | (0.08) | (0.18) | (-0.06) | (-0.15) | (-0.17) | |
| Maturity | 0.164 | 0.163 | | 0.0761 | 0.170 | 0.131 | 0.211 | 0.185 | 0.175 | |
| | (0.67) | (0.71) | | (0.33) | (0.69) | (0.54) | (0.90) | (0.76) | (0.71) | |
| Log(Bank Assets) | 0.314 | 0.313 | 0.258 | | 0.234 | 0.311 | 0.366 | 0.415* | 0.322 | 0.282 |
| | (1.14) | (1.15) | (0.98) | | (0.95) | (1.14) | (1.38) | (1.80) | (1.17) | (1.04) |
| Bank Capitilization | -0.126 | -0.125 | -0.131 | -0.285 | | -0.156 | -0.213 | -0.212 | -0.921 | -0.753 |
| | (-0.65) | (-0.66) | (-0.68) | (-0.16) | | (-0.83) | (-1.26) | (-1.45) | (-0.49) | (-0.43) |
| Tier-1 Capital Ratio | 0.175 | 0.174 | 0.137 | 0.172 | 0.217 | | 0.0546 | 0.189 | 0.205 | 0.193 |
| | (0.64) | (0.67) | (0.52) | (0.63) | (0.82) | | (0.25) | (0.70) | (0.75) | (0.71) |
| Total Capital Ratio | -0.164 | -0.164 | -0.151 | -0.222 | -0.232 | -0.0802 | | -0.101 | -0.186 | -0.196 |
| | (-0.76) | (-0.77) | (-0.70) | (-1.05) | (-1.22) | (-0.47) | | (-0.53) | (-0.87) | (-0.93) |
| $\frac{Nonperformingloans}{TotalLoans}$ | 0.397 | 0.398 | 0.446 | 0.763 | 0.642 | 0.436 | 0.133 | | 0.390 | 0.527 |
| | (0.68) | (0.70) | (0.77) | (1.54) | (1.43) | (0.74) | (0.25) | | (0.67) | (0.96) |
| $\frac{Nonperformingloans}{TotalAssets}$ | -0.316 | -0.317 | -0.327 | -0.323 | -0.279 | -0.338 | -0.298 | -0.320 | | -0.138 |
| | (-1.01) | (-1.02) | (-1.04) | (-1.04) | (-0.94) | (-1.07) | (-0.95) | (-1.00) | | (-1.18) |
| $\frac{Nonperformingassets}{TotalAssets}$ | 0.198 | 0.199 | 0.192 | 0.132 | 0.112 | 0.221 | 0.242 | 0.277 | -0.0992 | |
| | (0.62) | (0.62) | (0.59) | (0.42) | (0.40) | (0.68) | (0.75) | (0.89) | (-0.84) | |
| N | 104 | 104 | 104 | 104 | 104 | 104 | 105 | 104 | 104 | 104 |
| pseudo R-sq | 0.064 | 0.064 | 0.061 | 0.054 | 0.061 | 0.061 | 0.056 | 0.061 | 0.056 | 0.061 |
| Log lik. | -64.40 | -64.40 | -64.63 | -65.06 | -64.62 | -64.61 | -65.42 | -64.64 | -64.96 | -64.61 |

t-statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%.

**Table 2.3:**
**Subcon Exposure and Secured Loan (with Borrower Fixed Effects)**

This table reports logit regressions, where the dependent variable, *Secured*, takes a value of 1 if the loan is a secured loan. *SubconRatio* is a time varying variable for each lender and calculated as the ratio of number of total subcon cases to total number of bankruptcy cases. It was multiplied by 100 to be represented in percentages. The regression includes borrower fixed effects, year fixed effects and S&P Long Term Debt Rating dummy variables for each rating. Explanations of other independent variables are provided in the Appendix.

| | Dependent Variable: SECURED (0-1 Variable) | | | | | | |
|---|---|---|---|---|---|---|---|
| VARIABLES | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Subcon Ratio | 0.00415*** | 0.00384*** | 0.00421*** | 0.00424*** | 0.00400*** | 0.00408*** | 0.00416 *** |
| | (2.64) | (2.67) | (3.11) | (2.91) | (2.77) | (2.63) | (2.72) |
| Zscore | -0.465*** | | -0.453 | -0.487 | -0.461*** | -0.422*** | -0.465 |
| | (-4.76) | | (-1.18) | (-1.19) | (-4.86) | (-4.52) | (-1.17) |
| Tangibility | 0.0108 | 0.00321 | | 0.0122 | 0.0104 | 0.00995 | 0.0109 |
| | (1.00) | (0.31) | | (0.81) | (0.97) | (1.02) | (0.78) |
| Log(Assets) | 0.128 | 0.219 | 0.135 | | 0.159 | 0.111 | 0.134 |
| | (1.27) | (0.57) | (0.90) | | (1.62) | (1.15) | (0.91) |
| Lender Capitilization | -0.103 | -0.105 | -0.102 | -0.104 | | -0.116 | -0.103 |
| | (-1.23) | (-0.53) | (-0.86) | (-0.87) | | (-1.42) | (-0.86) |
| Log(Maturity) | 0.216*** | 0.199 | 0.217 | 0.216 | 0.213*** | | 0.217 |
| | (5.16) | (0.58) | (1.19) | (1.19) | (5.21) | | (1.18) |
| Log(Loan Amount) | 0.00687 | 0.0177 | 0.00940 | 0.0154 | 0.000752 | 0.0300 | |
| | (0.24) | (0.44) | (0.32) | (0.50) | (0.03) | (1.09) | |
| | | | | | | | |
| Rating Dummies | YES | YES | YES | YES | YES | YES | YES |
| Time Fixed Effect | YES | YES | YES | YES | YES | YES | YES |
| Borrower Fixed Effect | YES | YES | YES | YES | YES | YES | YES |
| N | 1145 | 1193 | 1145 | 1145 | 1160 | 1145 | 1145 |
| pseudo R-sq | 0.437 | 0.410 | 0.436 | 0.436 | 0.424 | 0.419 | 0.437 |
| Log lik. | -446.3 | -487.3 | -447.0 | -447.1 | -462.1 | -460.7 | -446.3 |

t-statistics in parentheses
\* significant at 10%; ** significant at 5%; *** significant at 1%.

**Table 2.4:**
**Subcon Exposure and Secured Loan (without Borrower Fixed Effects)**

This table reports marginal effects of logit regressions, where the dependent variable, *Secured*, takes a value of 1 if the loan is a secured loan. *SubconRatio* is a time varying variable for each lender and calculated as the ratio of number of total subcon cases to total number of bankruptcy cases. It was multiplied by 100 to be represented in percentages. The regression includes year fixed effects and S&P Long Term Debt Rating dummy variables for each rating. Explanations of other independent variables are provided in the Appendix.

| VARIABLES | Dependent Variable: SECURED (0-1 Variable) | | | | | | |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Subcon Ratio | 0.00319*** | 0.00348*** | 0.00324*** | 0.00299*** | 0.00355*** | 0.00324*** | 0.00317*** |
| | (4.03) | (4.42) | (4.07) | (3.79) | (4.81) | (4.13) | (4.00) |
| Zscore | -0.106*** | | -0.105*** | -0.0917*** | -0.103*** | -0.0952*** | -0.106*** |
| | (-5.85) | | (-5.71) | (-5.18) | (-5.71) | (-5.25) | (-5.85) |
| Tangibility | 0.00225 | 0.00149 | | 0.00254 | 0.00201 | 0.00216 | 0.00230 |
| | (1.39) | (0.99) | | (1.56) | (1.27) | (1.36) | (1.42) |
| Log(Assets) | -0.0509*** | -0.0306** | -0.0523*** | | -0.0474*** | -0.0754*** | -0.0422*** |
| | (-3.81) | (-2.35) | (-3.89) | | (-3.61) | (-5.74) | (-4.08) |
| Lender Capitalization | -0.0606 | -0.0813** | -0.0589 | -0.0580 | | -0.0578 | -0.0646 |
| | (-1.50) | (-2.02) | (-1.45) | (-1.43) | | (-1.44) | (-1.60) |
| Log(Maturity) | 0.148*** | 0.162*** | 0.150*** | 0.167*** | 0.143*** | | 0.154*** |
| | (7.47) | (8.05) | (7.49) | (8.53) | (7.33) | | (8.02) |
| Log(Loan Amount) | 0.0122 | 0.00453 | 0.0129 | -0.0163* | 0.00811 | 0.0382*** | |
| | (1.03) | (0.38) | (1.07) | (-1.75) | (0.70) | (3.34) | |
| | | | | | | | |
| Rating Dummies | YES | YES | YES | YES | YES | YES | YES |
| Time Fixed Effect | YES | YES | YES | YES | YES | YES | YES |
| Borrower Fixed Effect | NO | NO | NO | NO | NO | NO | NO |
| | | | | | | | |
| N | 4031 | 4031 | 4031 | 4031 | 4031 | 4031 | 4031 |
| pseudo R-sq | 0.546 | 0.538 | 0.545 | 0.544 | 0.541 | 0.546 | 0.535 |
| Log lik. | -1272.4 | -1386.0 | -1273.7 | -1279.0 | -1303.2 | -1272.8 | -1303.7 |

t-statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%.

## Table 2.5:
## Interest Rate Spread (without Borrower Fixed Effects)

This table reports regressions of the interaction term, $SubConRatio \times Unsecured$, and other related variables to interest rate spread. The regression is performed on facility level (i.e, not package) since credit line and loans have different interest rates. Loan dummies control for term loans and credit lines. The dependent variable, interest rate spread, is used in basis points. $Unsecured$ is a binary variable, taking a value of 1 if the facility is an unsecured loan. $SubconRatio$ is a time varying variable for each lender and calculated as the ratio of number of total subcon cases to total number of bankruptcy cases, in which lender's role was lead arranger in the syndication. It was multiplied by 100 to be represented in percentages. $\Delta LenderCap$, indicates the depreciation of lender capitalization in the last quarter. The regression includes year fixed effects and S&P Long Term Debt Rating dummy variables for each rating. Explanations of other independent variables are provided in the Appendix.

| VARIABLES | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| $SubConRatio \times Unsecured$ | 0.285** | 0.250** | 0.268** | 0.266** | 0.261** | 0.212* | 0.283** | 0.204 |
| | (2.26) | (2.08) | (2.11) | (2.23) | (2.08) | (1.65) | (2.24) | (1.59) |
| SubCon Ratio | 0.396*** | 0.373*** | 0.419*** | 0.383*** | 0.346*** | 0.362*** | 0.397*** | 0.364*** |
| | (5.32) | (5.25) | (5.59) | (5.32) | (4.85) | (4.78) | (5.33) | (4.80) |
| Unsecured | -0.381*** | -0.426*** | -0.402*** | -0.407*** | -0.393*** | -0.459*** | -0.376*** | -0.451*** |
| | (-4.33) | (-5.07) | (-4.55) | (-4.89) | (-4.48) | (-5.14) | (-4.28) | (-5.04) |
| $\Delta LenderCap$ | 0.591* | | 0.667** | 0.579* | 0.461 | 0.660** | 0.596* | 0.673** |
| | (1.84) | | (2.06) | (1.88) | (1.45) | (2.02) | (1.85) | (2.05) |
| Log(Assets) | 0.100*** | 0.105*** | | 0.110*** | 0.975*** | -0.021 | 0.102*** | 0.0871 |
| | (8.36) | (9.03) | | (9.70) | (8.16) | (-0.22) | (8.67) | (0.09) |
| Zscore | -0.928*** | -0.948*** | -1.051*** | | -0.927*** | -0.912*** | -0.943*** | -0.949*** |
| | (-6.71) | (-6.89) | (-7.60) | | (-6.70) | (-6.48) | (-6.85) | (-6.76) |
| Lender Cap. | 0.877** | 0.637* | 0.628* | 0.730** | | 0.453 | 0.887** | 0.466 |
| | (2.44) | (1.88) | (1.75) | (2.13) | | (1.25) | (2.47) | (1.28) |
| Log(Loan Amount) | -0.189*** | -0.196*** | -0.122*** | -0.189*** | -0.186*** | | -0.191*** | |
| | (-14.21) | (-15.01) | (-11.43) | (-14.83) | (-14.05) | | (-14.50) | |
| Log(Loan Maturity) | -0.266 | -0.100 | -0.531*** | -0.369* | -0.281 | -0.633*** | | |
| | (-1.32) | (-0.51) | (-2.65) | (-1.92) | (-1.39) | (-3.10) | | |
| Rating Dummies | YES | YES | YES | YES | YES | YES | YES | YES |
| Time Fixed Effect | YES | YES | YES | YES | YES | YES | YES | YES |
| Borrower Fixed Effect | NO | NO | NO | NO | NO | NO | NO | NO |
| Loan Dummies | YES | YES | YES | YES | YES | YES | YES | YES |
| | | | | | | | | |
| N | 5627 | 5768 | 5627 | 6005 | 5630 | 5627 | 5627 | 5627 |
| Adj. R-sq | 0.625 | 0.623 | 0.621 | 0.630 | 0.625 | 0.612 | 0.625 | 0.611 |

Dependent Variable: Interest Rate Spread

t-statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%.

**Table 2.6:**
**Contract Strictness (for Unsecured Loans)**

This table reports regressions of *SubConRatio*, and other related variables to contract strictness for the sample of unsecured loans. The dependent variable, contact strictness, is used in percentages. *SubconRatio* is a time varying variable for each lender and calculated as the ratio of number of total subcon cases to total number of bankruptcy cases. It was multiplied by 100 to be represented in percentages. The regression includes year fixed effects and S&P Long Term Debt Rating dummy variables for each rating. Explanations of other independent variables are provided in the Appendix.

| | Dependent Variable: Contract Strictness | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| VARIABLES | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| SubCon Ratio | 0.0876** | 0.0876** | 0.0913** | 0.0890** | 0.0828** | 0.0800** | 0.0873** | 0.0871** |
| | (2.21) | (2.21) | (2.35) | (2.24) | (2.09) | (2.03) | (2.20) | (2.20) |
| Zscore | -2.660*** | -2.660*** | | -2.004** | -2.170** | -2.701*** | -2.613*** | -2.672*** |
| | (-2.77) | (-2.77) | | (-2.19) | (-2.31) | (-2.81) | (-2.74) | (-2.79) |
| Tangibility | 0.316** | 0.316** | 0.154 | | 0.308** | 0.304** | 0.312** | 0.313** |
| | (2.21) | (2.21) | (1.14) | | (2.15) | (2.13) | (2.19) | (2.20) |
| Log(Assets) | -1.850** | -1.850** | -1.171 | -1.806** | | -1.759** | -1.874** | -1.973*** |
| | (-2.31) | (-2.31) | (-1.54) | (-2.25) | | (-2.20) | (-2.35) | (-3.34) |
| Lender Cap | -3.592 | -3.592 | -3.021 | -3.315 | -3.303 | | -3.492 | -3.611 |
| | (-1.40) | (-1.40) | (-1.21) | (-1.29) | (-1.28) | | (-1.37) | (-1.41) |
| Log(Loan Maturity) | 0.362 | 0.362 | -0.130 | 0.251 | 0.511 | 0.259 | | 0.327 |
| | (0.42) | (0.42) | (-0.15) | (0.29) | (0.59) | (0.30) | | (0.38) |
| Log(Loan Amount) | -0.187 | -0.187 | -0.464 | -0.0300 | -1.458** | -0.238 | -0.127 | |
| | (-0.23) | (-0.23) | (-0.59) | (-0.04) | (-2.41) | (-0.29) | (-0.16) | |
| | | | | | | | | |
| Rating Dummies | YES | YES | YES | YES | YES | YES | YES | YES |
| Time Fixed Effect | YES | YES | YES | YES | YES | YES | YES | YES |
| Borrower Fixed Effect | NO | NO | NO | NO | NO | NO | NO | NO |
| | | | | | | | | |
| N | 737 | 737 | 788 | 737 | 737 | 739 | 737 | 737 |
| Adj. R-sq | 0.096 | 0.096 | 0.095 | 0.091 | 0.090 | 0.096 | 0.097 | 0.097 |

t-statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%.

**Table 2.7:**
**Contract Strictness (for Secured Loans)**

This table reports regressions of *SubConRatio*, and other related variables to contract strictness for the sample of secured loans. The dependent variable, contact strictness, is used in percentages. *SubconRatio* is a time varying variable for each lender and calculated as the ratio of number of total subcon cases to total number of bankruptcy cases. It was multiplied by 100 to be represented in percentages. The regression includes year fixed effects and S&P Long Term Debt Rating dummy variables for each rating. Explanations of other independent variables are provided in the Appendix.

| VARIABLES | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| | Dependent Variable: Contract Strictness | | | | | | | |
| Subcon Ratio | -0.0449 | -0.0449 | -0.0511 | -0.0483 | -0.0417 | -0.0311 | -0.0440 | -0.0436 |
| | (-0.81) | (-0.81) | (-0.91) | (-0.87) | (-0.73) | (-0.59) | (-0.79) | (-0.79) |
| Zscore | -2.440** | -2.440** | | -2.516** | -2.257** | -2.422** | -2.386** | -2.449** |
| | (-2.30) | (-2.30) | | (-2.37) | (-2.08) | (-2.28) | (-2.27) | (-2.31) |
| Tangibility | -0.00491 | -0.00491 | -0.00488 | | -0.00515* | -0.00491 | -0.00479 | -0.00497* |
| | (-1.63) | (-1.63) | (-1.59) | | (-1.68) | (-1.63) | (-1.60) | (-1.66) |
| Log(Assets) | -4.909*** | -4.909*** | -5.382*** | -4.948*** | | -4.742*** | -5.051*** | -4.692*** |
| | (-4.06) | (-4.06) | (-4.47) | (-4.08) | | (-3.93) | (-4.37) | (-5.73) |
| Log(Lender Cap) | -0.346 | -0.346 | -1.444 | -0.643 | 0.263 | | -0.370 | -0.347 |
| | (-0.12) | (-0.12) | (-0.49) | (-0.22) | (0.09) | | (-0.13) | (-0.12) |
| Log(Loan Maturity) | 0.882 | 0.882 | -1.108 | 0.546 | 3.371 | 0.783 | | 1.087 |
| | (0.41) | (0.41) | (-0.52) | (0.26) | (1.61) | (0.37) | | (0.55) |
| Log(Loan Amount) | 0.321 | 0.321 | 1.557 | 0.513 | -3.600*** | 0.355 | 0.534 | |
| | (0.24) | (0.24) | (1.20) | (0.39) | (-3.94) | (0.27) | (0.44) | |
| Rating Dummies | YES | YES | YES | YES | YES | YES | YES | YES |
| Time Fixed Effect | YES | YES | YES | YES | YES | YES | YES | YES |
| Borrower Fixed Effect | NO | NO | NO | NO | NO | NO | NO | NO |
| N | 364 | 364 | 378 | 364 | 364 | 367 | 364 | 364 |
| Adj. R-sq | 0.151 | 0.151 | 0.131 | 0.146 | 0.111 | 0.141 | 0.153 | 0.153 |

t-statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%.

**Table 2.8:**
**Contract Strictness (with Borrower Fixed Effects)**

This table reports regressions of $SubConRatio \times Unsecured$, and other related variables to contract strictness. The dependent variable, contact strictness, is used in percentages. $Unsecured$ is a binary variable, taking a value of 1 if the package is an unsecured loan. $SubconRatio$ is a time varying variable for each lender and calculated as the ratio of number of total subcon cases to total number of bankruptcy cases. It was multiplied by 100 to be represented in percentages. The regression includes borrower fixed effects, year fixed effects and S&P Long Term Debt Rating dummy variables for each rating. Explanations of other independent variables are provided in the Appendix.

| | Dependent Variable: Contract Strictness | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| VARIABLES | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| *SubConRatio* ×*Unsecured* | 0.118* | 0.118* | 0.115* | 0.119* | 0.108* | 0.0895 | 0.116* | 0.118* |
| | (1.91) | (1.91) | (1.88) | (1.93) | (1.74) | (1.50) | (1.89) | (1.92) |
| Unsecured | -9.323** | -9.323** | -8.283** | -9.396** | -9.045** | -7.739* | -9.276** | -9.325** |
| | (-2.26) | (-2.26) | (-2.01) | (-2.27) | (-2.17) | (-1.91) | (-2.25) | (-2.26) |
| Subcon Ratio | -0.0393 | -0.0393 | -0.0346 | -0.0408 | -0.0358 | -0.0185 | -0.0380 | -0.0394 |
| | (-0.80) | (-0.80) | (-0.70) | (-0.83) | (-0.72) | (-0.39) | (-0.78) | (-0.81) |
| Zscore | -2.378*** | -2.378*** | | -2.410*** | -1.929*** | -2.410*** | -2.336*** | -2.378*** |
| | (-3.49) | (-3.49) | | (-3.54) | (-2.84) | (-3.54) | (-3.45) | (-3.49) |
| Tangibility | -0.00412 | -0.00412 | -0.00444 | | -0.00407 | -0.00423 | -0.00406 | -0.00412 |
| | (-1.49) | (-1.49) | (-1.59) | | (-1.46) | (-1.53) | (-1.47) | (-1.49) |
| Log(Assets) | -2.949*** | -2.949*** | -2.619*** | -2.945*** | | -2.836*** | -3.003*** | -2.962*** |
| | (-4.49) | (-4.49) | (-4.08) | (-4.48) | | (-4.32) | (-4.61) | (-6.21) |
| Log(Lender Cap) | -2.104 | -2.104 | -2.517 | -2.226 | -1.749 | | -2.043 | -2.104 |
| | (-1.10) | (-1.10) | (-1.34) | (-1.17) | (-0.91) | | (-1.07) | (-1.10) |
| Log(Loan Maturity) | 0.503 | 0.503 | -0.208 | 0.457 | 0.998 | 0.439 | | 0.498 |
| | (0.61) | (0.61) | (-0.26) | (0.56) | (1.22) | (0.54) | | (0.62) |
| Log(Loan Amount) | -0.0191 | -0.0191 | 0.144 | 0.0162 | -2.105*** | -0.0198 | 0.0771 | |
| | (-0.03) | (-0.03) | (0.22) | (0.02) | (-4.25) | (-0.03) | (0.12) | |
| Rating Dummies | YES | YES | YES | YES | YES | YES | YES | YES |
| Time Fixed Effect | YES | YES | YES | YES | YES | YES | YES | YES |
| Borrower Fixed Effect | YES | YES | YES | YES | YES | YES | YES | YES |
| N | 1101 | 1101 | 1166 | 1101 | 1101 | 1106 | 1101 | 1101 |
| Adj. R-sq | 0.145 | 0.145 | 0.134 | 0.144 | 0.130 | 0.142 | 0.145 | 0.146 |

t-statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%.

**Table 2.9:**
**Collateral Demand after WorldCom**

| VARIABLES | Dependent Variable: SECURED (0-1 Variable) | | | | | | |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Post-WorldCom | 0.319*** | 0.344*** | -0.0561 | 0.199*** | 0.524*** | 0.313*** | 0.518*** |
| | (4.21) | (4.57) | (-0.81) | (2.78) | (7.24) | (4.14) | (7.19) |
| Zscore | -0.967*** | -0.943*** | -0.729*** | -0.908*** | -0.971*** | -0.969*** | -0.982*** |
| | (-20.07) | (-19.86) | (-17.69) | (-20.49) | (-20.14) | (-20.14) | (-20.45) |
| Tangibility | 0.0244*** | | 0.0336*** | 0.0253*** | 0.0249*** | 0.0244*** | 0.0248*** |
| | (4.81) | | (6.52) | (5.09) | (4.93) | (4.81) | (4.95) |
| Log(Assets) | -1.051*** | -1.072*** | | -0.994*** | -1.204*** | -1.016*** | -1.037*** |
| | (-21.12) | (-21.64) | | (-21.06) | (-25.04) | (-29.37) | (-29.93) |
| Log(Lender Cap) | -0.807*** | -0.815*** | -0.699*** | | -0.745*** | -0.807*** | -0.740*** |
| | (-6.37) | (-6.45) | (-5.86) | | (-6.04) | (-6.37) | (-6.02) |
| Log(Loan Maturity) | 0.615*** | 0.617*** | 0.958*** | 0.590*** | | 0.632*** | |
| | (11.33) | (11.42) | (18.80) | (11.26) | | (12.36) | |
| Log(Loan Amount) | 0.0415 | 0.0413 | -0.711*** | 0.0180 | 0.202*** | | |
| | (0.97) | (0.97) | (-24.56) | (0.44) | (5.19) | | |
| N | 5384 | 5385 | 5384 | 5861 | 5384 | 5384 | 5384 |
| Adj. R-sq | 0.264 | 0.259 | 0.187 | 0.260 | 0.244 | 0.264 | 0.241 |
| Log. Likelihood | -2559.1 | -2576.6 | -2825.6 | -2746.8 | -2626.2 | -2559.5 | -2639.1 |

t-statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%.

## 2.6 Figures

This figure shows a simplified version of the situation in the Owens Corning bankruptcy case. In this representation, Subsidiaries 1 and 2 stand for the significant assets that provided the guarantees for the loans. Subsidiary 3 represents a group of nonsignificant subsidiaries, valued at less than $30 million, which did not provide guarantees. Although the bank loans were written at the parent level, the banks had claims to both Subsidiaries 1 and 2 because they provided guarantees. Hence, the effective lender claims in those subsidiaries were also $2 billion. The noteholders had claims only on the parent company at a value of $4 billion. The last row shows the consolidated values for the company assets and creditor claims.

| Entity | Asset Value | Noteholder Claims | Bank Loan | Lender Claims |
|--------|-------------|-------------------|-----------|---------------|
| Parent | $980 mil | $4billion | $2billion | $2billion |
| Subsidiary 1 | $1 billion | 0 | 0 | $2billion |
| Subsidiary 2 | $1 billion | 0 | 0 | $2billion |
| Subsidiary 3 | $20 million | 0 | 0 | 0 |
| Consolidated | $3 billion | $4billion | $2billion | N/A |

Due to Interliability Agreements

**Figure 2.2:** Total Number of Bankruptcies vs Subcon Ratio

This figure shows each lender in the sample by total bankruptcies and subcon exposure. "Total Number of Bankruptcies" is the lender's all bankruptcies, in which it had existing unsecured loans at the time debtor filed bankruptcy. *SubconRatio* is calculated as the ratio of number of total subcon cases to total number of bankruptcy cases. This figure was plotted for each lender's end-of-period values.

## Figure 2.3

### Frequency of Substantive Consolidation By Asset Size



## Figure 2.4

### Number of Days in Bankruptcy By Asset Size

Figure 2.5

**Frequency of Substantive Consolidation By Jurisdiction**



DE: District of Delaware, SDNY: Southern District of New York

Figure 2.6

**Frequency of Substantive Consolidation By Jurisdiction
in Jumbo Cases (>$1billion)**



DE: District of Delaware, SDNY: Southern District of New York

Figure 2.7

**Frequency of Substantive Consolidation By Year**



**Figure 2.8**

**Frequency of Substantive Consolidation By Year
in Jumbo Cases (> $1 billion)**

Figure 2.9

**Percentage of Bankruptcy Filings By Jurisdiction**



- DE 37%
- SDNY 20%
- Other 43%
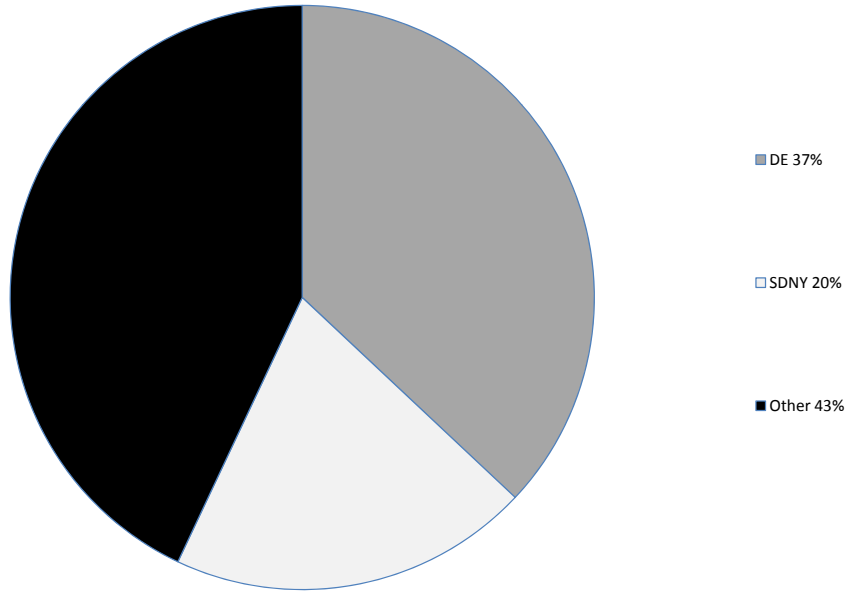
Figure 2.10

**Percentage of Bankruptcy Filings By Jurisdiction in Jumbo Cases (>$1bil.)**



- DE 35%
- SDNY 31%
- Other 34%
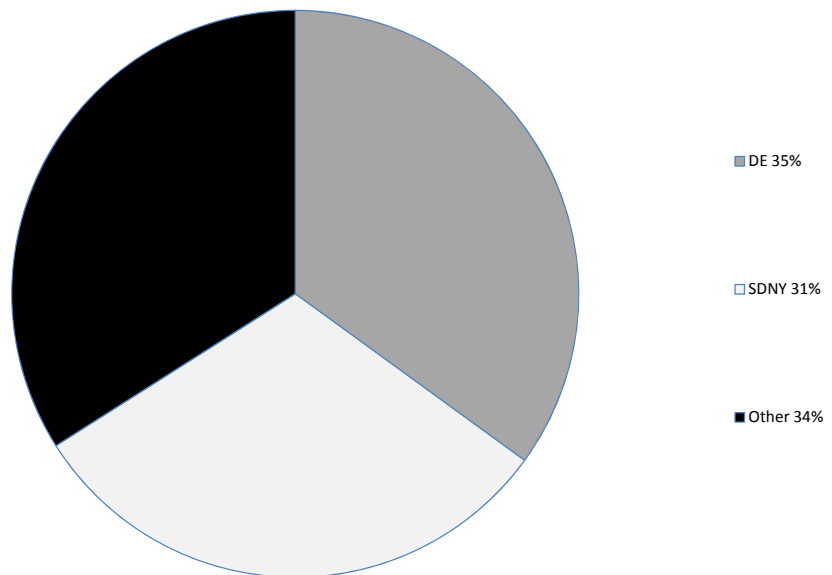
**Figure 2.11:** Aggregate Market Movement to WorldCom Substantive Consolidation

This figure shows the time-series secured ratio, (Total amount of secured loans)/ (Total Amount of Loans), for all loans that were originated in US and have information in secured field in LPC Dealscan Database. All facilities were aggregated under packages using "packageid". Following Chava and Roberts (2008), earliest facility start date was used for package initialization date.
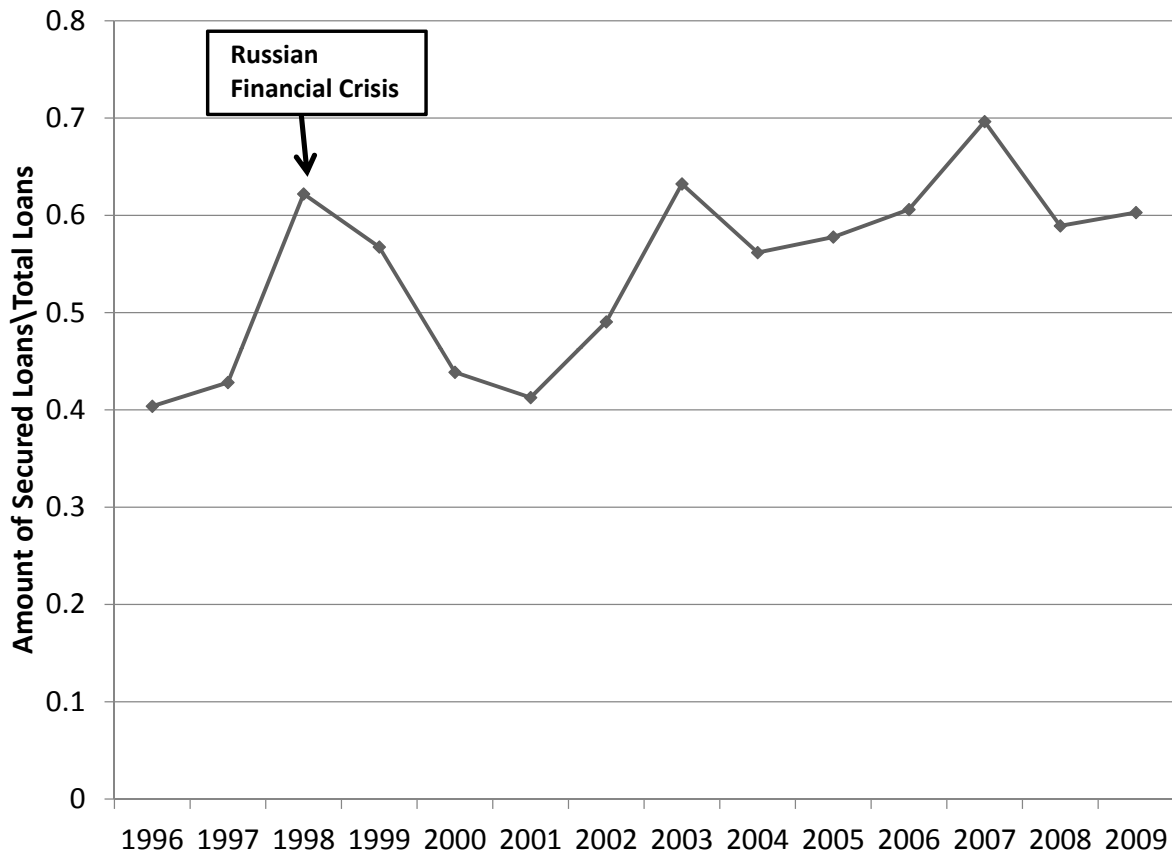
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# Appendix A

# Patent Lawsuits

## A.1 Patent Lawsuit Defense Mechanisms

### A.1.1 Invalidity

In US, a patent application is filed with United States Patent and Trademark Office (USPTO) and examined by patent examiners to assess whether the invention satisfy patenting requirements. Even though USPTO grants a patent, an alleged infringer may assert that, patent should be invalidated because the inventor failed to comply with the basic requirements for patentability. About invalidity defense, there are several doctrines that an alleged infringer may ground his arguments. These doctrines can be based in three broad categories: doctrines that ensure invention is a major contribution to the existing art; doctrines that ensure an invention is fully disclosed to the public; doctrines that ensure inventions are in the scope of patentable subjects.

First, to be a major contribution, pursuant to 35 U.S.C §101, an invention should be "new and useful" and, pursuant to §103, it should be "nonobvious". To have "new and useful" property, an invention should have two elements: utility and novelty, as described in §102.

In litigations, typically the utility requirement is not difficult to meet for the patent holders. Therefore, the issue on validity decision generally centers on the novelty and nonobviousness requirements. To be considered novel, an invention must not be wholly anticipated by the so called "prior art" or public domain materials such as publications and other patents. Nonobviousness doctrine adds to this by requiring that an invention not have been obvious to a person having ordinary skill in the art as of the time of invention.

Second, a patent should be fully disclosed to the public with a written description, best-mode and definiteness requirements. The written description and definiteness ensure that public knows the boundaries of a patent so that they would better predict whether their product falls into the domain of patent's claims. Best-mode doctrine, however, is related for the term after a patent expired. It requires that details of the invention is fully disclosed so that someone who is skilled in the art of the invention can easily build upon the written description.

Thirdly, the invention should be in the scope of the patentable subjects. 35 USC §101 lists the patentable matters as: "Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent." This description prevents an inventor from obtaining a patent on an overly abstract, laws of nature or physical phenomena invention that would preempt subsequent innovation. Even though patentable subjects are defined in U.S.C, with the improvement of technology, boundaries of patentable subjects induce important debates. For example, in a recent case, Myriad Genetics was sued over its claim of patents relating to two types of biological material that it identified (BRCA1 and BRCA2), whose mutations

are linked to increased hereditary risk for breast and ovarian cancer. On June 2013, the Supreme Court unanimously ruled that human genes cannot be patented. They also noted, however, that a synthetic version of the gene material may be in the scope of patentable subjects[1].

## A.1.2 Noninfringement

Patent infringement is the unauthorized manufacture, use, sale, or importation of a patented invention[2]. To achieve a legal enforcement, patent holder ordinarily bears the burden of proving infringement[3]. After the being alleged for infringing a patent, a defendant argues that alleged infringed product does not fall into the boundary of the described patent claims.

A patent claim generally contains three elements. First, it has a preamble setting, which describes the general description of the invention. For example, a claim to an improved monitor might have the preamble "A monitor...". Second, patent claims have a a transitional word or phrase such as "comprising, consisting of and consisting essentially of". These phrases explain the ingredients of the invention. Finally, patent claims have the body part, which explains the details of the invention.

There can be two types of infringement: "literal infringement" and infringement under the "doctrine of equivalents". The term "literal infringement" means that the device, system

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[1]http://www.cnn.com/2013/06/13/politics/scotus-genes/

[2]The definition of "patent infringement" can be found in 35 U.S.C. §271(a) which defines direct infringement as: "makes, uses, offers to sell, or sells any patented invention, within the United States or imports into the United States any patented invention during the term of the patent". In addition, 35 U.S.C. §271(b) extends liability for infringement to those who"actively induces" another to infringe a patent, and 35 U.S.C. §271(c) extends liability to contributory infringers as follows: "whoever sells a component of a patented machine, manufacture, combination or composition, or a material or apparatus for use in practicing a patented process, constituting a material part of the invention, knowing the same to be especially made or especially adapted for use in an infringement of such patent, and not a staple article or commodity of commerce suitable for substantial non-infringing use, shall be liable as a contributory infringer".

[3]In declaratory judgment actions, the burden shifts to the plaintiff to prove non-infringement

or method of another party completely embodies every element enumerated by at least one patent claim. However, even if there is no literal infringement, a claim may be infringed under the doctrine of equivalents if accused product or process contain elements identical or equivalent to each claimed element of the patented invention. The purpose of the doctrine is to prevent an infringer from stealing the benefit of a patented invention by changing only minor or insubstantial details of the claimed invention while retaining the same functionality. However, there are limits on the scope of doctrine of equivalents to which the patent owner is entitled. The scope of coverage is limited by (i) the doctrine of "prosecution history estoppel[4]" and (ii) the prior art.

In the light of these infringement types, the court process for determining whether an accused product infringes a claim can be summarized in three steps:

1. Claim construction (i.e, construe the scope of the "literal" language of the claims).

2. Compare the claims, that were construed by the court, with the accused product, to determine whether there is literal infringement.

3. If no literal infringement is found, then construe the scope of the claims under the doctrine of equivalents.

## A.2    An Example of Infringement Case: Apple vs. Samsung

In the first of the patent wars, on April 15, 2011, Apple sued Samsung in the United States District Court for the Northern District of California alleging that several of Samsung's An-

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[4]Prosecution history estoppel, also known as file-wrapper estoppel, means that a person who has filed a patent application, and then makes narrowing amendments, may be precluded from invoking the doctrine of equivalents to broaden the scope of their claims to cover subject matter ceded by the amendments.

droid phones and tablets, including the Nexus S, Epic 4G, Galaxy S 4G, and the Samsung

Galaxy Tab, infringed Apple's 3 utility and 4 design patents[5]. In this section, I will summa-

rize the noninfringement defenses of Samsung about US Patent No: 7,469,381 ('381)[6], which

was one of the most debated patents in the suit. Similar to majority of patent litigations,

the dispute on the noninfringement defense was based on construe of patent claim terms.

**Claim Construction Phase:**

The central point of the discussion about '381 patent was about the meaning of "display"

in Claim1.

> CLAIM 1 of the '381 Patent:
> A computer-implemented method, comprising:
>     at a device with a touch screen display:
>     displaying a first portion of an electronic document;
>     detecting a movement of an object on or near the touch screen display;
>     in response to detecting the movement, translating the electronic document displayed on the touch screen display in a first direction to display a second portion of the electronic document, wherein the second portion is different from the first portion;
>     in response to an edge of the electronic document being reached while translating the electronic document in the first direction while the object is still detected on or near the touch screen display:
>         displaying an area beyond the edge of the document, and
>         displaying a third portion of the electronic document, wherein the third portion is smaller than the first portion; and
>         in response to detecting that the object is no longer on or near the touch screen display, translating the electronic document in a second direction until the area beyond the edge of the electronic document is no longer displayed to display a fourth portion of the electronic document, wherein the fourth portion is different from the first portion.

In opposition to Apple's preliminary injunction motion, Samsung argued that "displaying

an area beyond the edge of the document" in claim1 of the '381 patent requires that at least

some of part of the area beyond the edge of the document emit light or be illuminated. Sam-

sung claimed that this construction is supported by the plain claim language. For example,

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[5]Utility Patents, US Patent No: 7,469,381, 7,844,915, and 7,864,163 and four design patents. US Patent No: D504,889, D593,087, D618,677, and D604,305

[6]The '381 patent is entitled "List scrolling and document translation, scaling, and rotation on a touch-screen display"

Claim 1 requires "displaying a first portion of an electronic document" and "display[ing] a second portion of the electronic document." In both situations, at least some of part of the first portion or second portions must emit light. Otherwise, the first or second portions would not be visible. Likewise, "displaying an area beyond the edge of the document" requires the emission of light in the area beyond the edge.

According to Samsung's claim construction, the areas beyond the edge of the documents that Apple identifies are all black so that these black areas are not "displayed" by the accused devices. This is because they use AMOLED screens. When an area of an AMOLED display is black, the pixels corresponding to that area are not emitting any light or being illuminated. Thus, there is a lack of any display, just as there is a lack of any display when the screen is turned off[7]. Despite Samsung's suggestion for claim construction, the court construed "displaying" as "showing or revealing to the viewer"[8]. Since this definition does not include "emitting light", Samsung was found infringing the '381 patent.

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[7]Samsung's Opposition To Apple's Motion For A Preliminary Injunction, Case No: 11-cv-01846-LHK
[8]Apple Inc. v. Samsung Elecs. Co., 2011 (N.D. Cal. Dec. 2, 2011) (No. 11-CV-01846-LHK),678 F.3d 1314 (Fed. Cir. 2012).

# A.3 Variable Definitions

## A.3.1 Financial Variables

**Assets** = ATQ

**Book Leverage** = Total Debt / Book Assets = (DLCQ+DLTTQ) / ATQ

**Capital Expenditure Ratio**= Quarterly capital expenditures (CAPXY) / lagged total assets (ATQ). CAPXY is reported on a year-to-quarter basis; thus I quarterize by subtracting lagged values.

**Cash** = Cash / Book Assets = CHEQ / ATQ

**R&D** = Research and development expenses (XRDQ) / lagged total assets(ATQ)

**Return on Assets (ROA)** = Operating income before depreciation (OIBDPQ) / lagged total assets (ATQ)

**Return on Equity (ROE)** =Income before extraordinary items/one-quarter-lagged book equity= IBQ/SEQQ

**Sales growth** = log(sales)- log(lagged sales)= log(SALEQ)-log(L.SALEQ)

**Sales** =SALEQ

## A.3.2 Innovation Variables

In this section, I use the variable definitions in Bena and Li (forth.).

**Self-Cite-Ratio:** First, I compute the number of awarded patents to the acquirer/target firm with award years from acquisiton year (ayr)-3 to ayr -1 that cite any of the ac-

quirer's/target firm's other awarded patents. Second, I scale the number from the first step by the total number of awarded patents to the acquirer/target firm with award years from ayr-3 to ayr-1.

**Knowledge Base Overlap** : First, we determine the set of patents that received at least one citation from any of the acquirer's patents with award years from ayr-3 to ayr-1 ("the acquirer's knowledge base"), the set of patents that received at least one citation from any of the target firm's patents awarded over the same three-year period ("the target firm's knowledge base"), and the intersection of these two sets as the set of patents cited by both the acquirer and the target firm ("the common knowledge base"). Second, we compute the number of patents in "the common knowledge base."

**Acquirer's (Target's) Base Overlap Ratio:** First, I compute the number of citations from any of the acquirer's (target firm's) patents with award years from ayr-3 to ayr-1 made to the patents in "the common knowledge base." Second, I scale the number from the first step by the number of citations from any of the acquirer's (the target firm's) patents with award years from ayr-3 to ayr-1 made to the patents in "the acquirer's knowledge base" ("the target firm's knowledge base").

**Acquirer's (Target's) Cross-Cites Ratio:** First, I compute the number of the acquirer's (target firm's) awarded patents with award years from ayr-3 to ayr-1 that cite any of the target firm's (acquirer's) awarded patents. Second, I scale the number from the first step by the number of the acquirer's (target firm's) awarded patents with award years from ayr-3 to ayr-1.

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# A.4 Patent Law Glossary

**Appelant:** The party, who applies to a higher court for a reversal of the decision of a lower court.

**Appellee:** The party, against whom an appeal is filed in the higher court.

**Concurring Opinion:** is a written opinion by one or more judges of a court which agrees with the ruling of the majority of the court, but states different reasons as the basis for his or her decision.

**Declaratory Judgment:** a lawsuit asking a court to declare a patent invalid or not infringed. **Defendant:** The party against whom an action or claim is brought in a court of law.

**Doctrine of Equivalents:** is an infringement type in which accused product or process contain elements identical or equivalent to each claimed element of the patented invention.

**Dissenting Opinion:** is an opinion in a legal case written by one or more judges expressing disagreement with the majority opinion of the court which gives rise to its judgment.

**Infringement:** is the unauthorized manufacture, use, sale, or importation of a patented invention.

**Injunction:** is a court order that requires a party to do or refrain from doing specific acts. In patent litigations, it is used as a court order that prohibits defendant to use, offer for sale, sell, and import the infringing product.

**Judgment as a matter of law (JMOL):** is a motion made by a party, during trial, claiming the opposing party has insufficient evidence to reasonably support its case.

**Lawsuit:** is a civil action brought in a court of law in which a plaintiff, a party who claims to have incurred loss as a result of a defendant's actions, demands a legal or equitable remedy.

**Literal infringement:** is an infringement type in which device, system or method of another party completely embodies every element enumerated by at least one patent claim.

**Patent:** is a grant by the government, grounded in Article I, section 8, clause 8 of the U.S. Constitution, that gives the patent owner the exclusive right to make, use, offer for sale, sell, and import the invention described in the patent for a specific term.

**Plaintiff:** is the party who initiates a lawsuit (also known as an action) before a court. By doing so, the plaintiff seeks a legal remedy, and if successful, the court will issue judgment in favor of the plaintiff and make the appropriate court order (e.g., an order for damages).

**Safe Harbor:** is a provision of a statute or a regulation that specifies that certain conduct will be deemed not to violate a given rule.

**Summary Judgment:** is a judgment entered by a court for one party and against another party summarily, i.e., without a full trial.

**Standard Essential Patent:** is a patent that claims an invention that must be used to comply with a technical standard.

**Writ of mandamus:** is an extraordinary court order because the case is made without the benefit of full judicial process. It is typically issued on a case that has already begun.

**Writ of Certiorari:** is a type of writ, by which Supreme Court decides whether to hear the case.

# Appendix B

# Variable Descriptions

### B.0.1   Variable Descriptions

**Amount** = The total amount of the loan package

**Capital Expenditure** = Sum of rolling four quarter capital expenditures

**Credit Rating** = S&P senior long-term debt rating Credit Spread = Yield spread between
Baa and Aaa Moody's rated corporate bonds

**Current Ratio** = Total current assets / total current liabilities Debt/Equity = (Long term
debt + debt in current liabilities) / shareholder equity

**Debt/Tangible Net Worth**=(Long term debt + debt in current liabilities) / (total assets-
total liabilities-intangible assets)

**EBITDA** = Sum of rolling four quarter operating income before depreciation EBITDA/Debt

= (Sum of rolling four quarter operating income before depreciation) /(long term debt + debt in current liabilities)

**Fixed Charge Coverage** = (Sum of rolling four quarter operating income before depreciation) / (sum of rolling four quarter interest expenses + debt in current liabilities one year prior)

**Lender Capitalization** = Lender shareholder equity /total assets

**Maturity** = The maximum stated maturity of a package in months

**Interest Coverage** = (Sum of rolling four quarter operating income before depreciation) / (sum of rolling four quarter interest expenses) Quick Ratio = (Total current assets - inventories) / total current liabilities

**Tangible Net Worth** = Total assets-total liabilities-intangible assets

**Z-Score**= 3.3 Pre-tax operating income / total assets + sales / total assets+ 1.4 retained earnings/ total assets + 1.2(current assets - current liabilities)/total assets+.6 market value of equity / total liabilities