Discussion of

Lending to Innovative Firms: The Role of Lender Expertise and Control Rights

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What is this Paper About?

- The paper examines whether loan pricing reflects a firm's patent portfolio.
  - Do patents matter for loan spreads?
  - Are the effects greater when:
    - patents are more highly cited ("citations").
    - patents are cited by subsequent patents belonging to a wide range of technology classes ("generality")
    - lenders have experience lending to firms with patents ("experienced lenders")
  - It also examines investment policies of firms violating covenants. Do firms with patents respond differently to covenant violations than firms without patents? Does lender experience affect how firms respond to covenant violations?
  - Does the stock market react less negatively to technical covenant violations of innovative firms?

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Do Lenders value Innovation? Comments

$$\text{Ln(All-in-drawn Spread)} = \alpha_1 + \beta_1 \text{High Patent} + \gamma_1 \prime FIRM + \gamma_2 \prime Loan + \gamma_3 \prime Macro + \lambda_i + \phi_j + \psi_t + \epsilon,$$

	Full Sample		*Patent Sample*	
	(1)	(2)	(3)	(4)
High Patent	-0.0719***	-0.0666***	-0.0520**	-0.0475**
	(-3.36)	(-3.27)	(-2.21)	(-2.10)
Ln(Assets)	-0.1667***	-0.1523***	-0.1721***	-0.1537***
	(-22.27)	(-22.99)	(-15.00)	(-13.57)
EBITDA/Assets	-0.9156***	-1.0489***	-0.9635***	-1.1464***
	(-15.71)	(-15.80)	(-8.91)	(-8.74)
Z Score	-0.0293***		-0.0292***	
	(-13.46)		(-8.25)	
Leverage		0.4742***		0.4987***
		(16.43)		(8.07)
Modified Z Score		-0.0132**		-0.0150
		(-2.33)		(-1.39)
Tangibility	-0.0958**	-0.1161***	-0.0685	-0.0736
	(-2.46)	(-3.32)	(-0.79)	(-0.89)
Performance Pricing Dummy	-0.1258***	-0.1217***	-0.1200***	-0.1132***
	(-10.93)	(-11.33)	(-6.00)	(-5.88)
Term Loan Dummy	0.2736***	0.2643***	0.3393***	0.3346***
	(24.61)	(25.76)	(16.36)	(16.82)
Ln(Loan Maturity)	-0.0729***	-0.0757***	-0.0561***	-0.0597***
	(-9.25)	(-9.83)	(-4.21)	(-4.53)
Term Spread	0.0002	0.0002**	0.0003	0.0003
	(1.43)	(1.98)	(1.33)	(1.54)
Credit Spread	-0.0005	-0.0005	-0.0001	-0.0000
	(-1.10)	(-1.09)	(-0.08)	(-0.04)
Observations	24,752	27,423	8,936	9,569
Adjusted R^2	0.599	0.605	0.649	0.654
Industry Dummies	✓	✓	✓	✓
Year Dummies	✓	✓	✓	✓
Credit Rating Dummies	✓	✓	✓	✓
Loan Purpose Dummies	✓	✓	✓	✓

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Do Lenders value Innovation? Comments Continued

- *High Patent* could measure many other firm characteristics that may affect pricing of loans.
  - Unmeasured quality of assets
  - Riskiness
  - Quality of management
  - Adverse selection
- Some obvious controls:
  - Market/book ratio
  - Earnings volatility
  - Cash holdings
  - Managerial ownership structure

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Do Lenders value Innovation? Comments Continued

- Lenders are likely to contract with firms on multiple dimensions. How do other non-price loan terms differ by patenting activity?
  - Loan maturity might differ systematically as a function of patent stock. Perhaps loans to innovative firms are shorter maturity.
  - Covenants in loan contracts might differ. Perhaps lenders require more covenants in these contracts.
- Sign on loan maturity in spread regressions?

Secured versus Unsecured Loans: Comments

	(1)	(2)
High Patent × Unsecured	-0.1450***	-0.1403***
	(-5.10)	(-5.05)
High Patent × Secured	0.0096	0.0145
	(0.41)	(0.65)
Unsecured	-0.6386***	-0.6346***
	(-32.87)	(-33.76)
Ln(Assets)	-0.0976***	-0.0899***
	(-16.78)	(-16.94)
EBITDA/Assets	-0.5920***	-0.7098***
	(-11.89)	(-12.28)
Z Score	-0.0190***	
	(-10.36)	
Leverage		0.3147***
		(12.99)
Modified Z Score		-0.0045
		(-0.97)
Tangibility	-0.0346	-0.0451
	(-1.07)	(-1.53)
Performance Pricing Dummy	-0.1760***	-0.1750***
	(-15.02)	(-16.10)
Term Loan Dummy	0.1849***	0.1831***
	(19.75)	(21.09)
Ln(Loan Maturity)	-0.0792***	-0.0830***
	(-10.17)	(-11.28)
Term Spread	0.0002	0.0002
	(1.21)	(1.52)
Credit Spread	-0.0004	-0.0002
	(-0.77)	(-0.45)

What Types of Innovations are Valuable to Lenders? Comments

	(1)	(2)	(3)	(4)
High Patent × High Citation per Patent	-0.0869***	-0.0867***		
	(-2.91)	(-3.00)		
High Patent × Low Citation per Patent	-0.0127	-0.0064		
	(-0.38)	(-0.20)		
High Citation per Patent	-0.0129	-0.0050		
	(-0.46)	(-0.19)		
High Patent × High Generality			-0.0829***	-0.0874***
			(-2.80)	(-3.07)
High Patent × Low Generality			-0.0172	-0.0062
			(-0.52)	(-0.20)
High Generality			-0.0206	-0.0036
			(-0.77)	(-0.14)

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What Types of Innovations are Valuable to Lenders? Comments Continued

- Table 5 includes interactions of *High Patent* with:
  - *Citations per patent*
  - *High Generality*
- More discussion and evidence on why these patent characteristics matter to lenders would help. What do these patent characteristics measure? Why are they relevant to lenders?
- Are the more highly cited and more general patents more liquid? Do they result in higher recoveries for lenders?
- Correlation between high citations per patent and high generality...shouldn't they be included together? What is the effect of higher liquidity of a patent after controlling for its quality?

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Lender Expertise in Lending to Innovative Firms: Comments

	Full Sample		*Patent Sample*	
	(1)	(2)	(3)	(4)
High Patent × High Lender Experience	-0.0882***	-0.0821***	-0.0835***	-0.0823***
	(-3.53)	(-3.44)	(-3.10)	(-3.18)
High Patent × Low Lender Experience	-0.0277	-0.0231	-0.0106	-0.0025
	(-0.93)	(-0.80)	(-0.38)	(-0.09)
High Lender Experience	-0.0224*	-0.0237**	-0.0078	0.0023
	(-1.79)	(-2.05)	(-0.31)	(0.10)
Ln(Assets)	-0.1649***	-0.1505***	-0.1686***	-0.1505***
	(-21.34)	(-22.11)	(-14.79)	(-13.35)

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Lender Expertise in Lending to Innovative Firms: Comments Continued

- Why do lenders differ in their ability to value patents? Which banks develop reputations for lending to firms with patents?
- Shouldn't lender expertise also determine the structure of loan contracts?
- How important is lender expertise beyond easily measurable attributes of patents such as citations and generality?
- Measure of lender experience
  - Lender experience with innovative firms is based on the fraction of loans to patenting firms over the loan sample period.
  - Unclear whether loans are to the same firms or different firms. Does it matter?

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Identification: Comments

WTO agreement on Trade-Related Aspects of Intellectual Property (TRIPS). The assumption is that the agreement improved the value of patents.

$$\begin{aligned}\text{Ln(All-in-drawn Spread)}_t = \alpha_5 &+ \beta_{11}\text{Post} \times \text{Ln(Patent)}_{t-1} \\ &+ \beta_{12}\text{Post} + \beta_{13}\text{Ln(Patent)}_{t-1} + \gamma_{13}\prime FIRM \\ &+ \gamma_{14}\prime Loan + \gamma_{15}\prime Macro + \lambda_i + \eta_k + \epsilon,\end{aligned}$$

- Did TRIPS actually increase the value of patents?
- Does it make patents more liquid? Does it affect debt recoveries in distress?

Identification: Comments Continued

	Year 1994-1997		*Year 1994-1999*	
	(1)	(2)	(3)	(4)
Ln(Patent Granted in Year t-1) × Post	-0.0475**	-0.0442**	-0.0495***	-0.0507***
	(-2.31)	(-2.19)	(-3.15)	(-3.21)
Post	-0.0412	-0.0607	0.0677*	0.0512
	(-0.77)	(-1.19)	(1.80)	(1.41)
Ln(Patent Granted in Year t-1)	-0.0198	-0.0275	0.0088	0.0051
	(-0.40)	(-0.59)	(0.23)	(0.13)
Ln(Assets)	-0.1527***	-0.1299***	-0.1315***	-0.1259***
	(-3.22)	(-2.92)	(-3.43)	(-3.52)

- How much of the effect is due to macro trends? Is it picking up trends in riskiness of firms with patents, or changes in our ability to assess those risks.

Lenders Actions During Covenant Violation: Comments

	$\Delta CAPEX/Average\ Assets_{t,t+4}$			$\Delta R\&D/Average\ Assets_{t,t+4}$		
	(1)	(2)	(3)	(4)	(5)	(6)
Violation	-0.0075***			-0.0007***		
	(-5.16)			(-3.01)		
Violation × Zero Patent		-0.0099***	-0.0097***		-0.0002	-0.0006***
		(-5.32)	(-5.31)		(-0.99)	(-2.79)
Violation × Non-Zero Patent		-0.0018	-0.0015		-0.0018***	-0.0022***
		(-0.93)	(-0.80)		(-4.01)	(-5.03)

Lenders Actions During Covenant Violation: Comments Continued

- Interpretation of findings: Lenders require cuts in R&D at firms that have patents but not cuts in capital expenditure. The reverse is true for firms without patents.
  - Wouldn't the R&D levels and patenting activities be correlated?
  - Non-zero patenting firms probably do significantly more R&D than borrowers with zero-patents (and invest relatively less in capital expenditures). Could that explain why R&D reductions are observed following covenant violations for patenting firms but not for non-patenting firms?

Lender Experience and Δ R&D: Comments Continued

	$\Delta CAPEX/Average\ Assets_{t,t+4}$		$\Delta R\&D/Average\ Assets_{t,t+4}$	
	(1)	(2)	(3)	(4)
Violation × Low Lender Experience	-0.0031	-0.0027	-0.0000	-0.0007
	(-1.00)	(-0.87)	(-0.06)	(-1.17)
Violation × High Lender Experience	-0.0039	-0.0034	-0.0014	-0.0019**
	(-1.38)	(-1.22)	(-1.59)	(-2.30)
High Lender Experience	0.0005	0.0004	0.0000	-0.0001
	(0.67)	(0.55)	(0.06)	(-0.27)

- Lender experience and debt structure (bank debt/total debt ratio).
- Firms with larger bank debt make deeper cuts in R&D following violation.
- How do results change with "Violation × Bank Debt" as an additional interaction in the regression.

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: Innovative Efficiency and ΔR&D: Comments Continued

$$\text{Innovative Efficiency}_t = \text{Patents Granted}_t/(\text{R\&D}_{t-2} + 0.8 \times \text{R\&D}_{t-3} + 0.6 \times \text{R\&D}_{t-4} + 0.4 \times \text{R\&D}_{t-5} + 0.2 \times \text{R\&D}_{t-6}).$$

	Low Innovative Efficiency		*High Innovative Efficiency*	
	(1)	(2)	(3)	(4)
Violation × Low Lender Experience	-0.0003	-0.0010	0.0002	-0.0005
	(-0.32)	(-1.06)	(0.15)	(-0.37)
Violation × High Lender Experience	-0.0028*	-0.0033**	-0.0008	-0.0013
	(-1.72)	(-2.13)	(-0.48)	(-0.81)
High Lender Experience	-0.0001	-0.0002	0.0001	0.0001
	(-0.13)	(-0.55)	(0.15)	(0.20)

	R&D above Industry Median		*R&D below Industry Median*	
	(1)	(2)	(3)	(4)
Violation × Low Lender Experience	-0.0003	-0.0010	-0.0006	-0.0006
	(-0.33)	(-1.14)	(-0.81)	(-0.77)
Violation × High Lender Experience	-0.0018	-0.0025**	-0.0005	-0.0005
	(-1.61)	(-2.34)	(-0.88)	(-1.06)
High Lender Experience	0.0000	-0.0000	0.0001	0.0001
	(0.14)	(-0.13)	(0.71)	(0.73)

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Other Questions

- How does leverage differ between patenting and non-patenting firms? How do other measures of default risk vary across the two classes of firms?
- How much of their debt is bank debt? What is the debt structure? How much cash do they hold? How does it vary as a function of patenting?
- Should yields on public debt respond similarly to patent portfolio of firms?

Conclusions

- Financing of innovative activity is a hugely important topic. Very interesting paper.
- The paper takes a major step towards examining bank financing of firms that have large patent portfolios. Examines the effect of patent quality on pricing of bank loans.