What is the Impact of Software Patent Shifts?: Evidence from *Lotus v. Borland*

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The essential challenge

- **Want to understand impact of patents:**
  - **Do they introduce wasteful activities?**
  - **Do they harm innovation?**
- **But just looking at cross-sectional relationships not enough:**
  - **More innovative likely to be more effective patentees.**
  - **Challenging of disaggregating effects.**

An alternative approach

- **Look at a shift in patent policy:**
  - **Should allow to isolate impact of policy shift:**
    - **What is impact on proxies for innovation?**
  - **Many other things will be constant.**

Challenges

- **Timing of policy shift may not be exogenous:**
  - **E.g., strengthening of Taiwanese patent law in early 1990s.**
- **Effects may take long time to be felt.**
- **Lots of noise in environment:**
  - **May lead to false conclusion that effect…. or no effect.**

The methodology

- **Choose an unexpected event that impacted attractiveness of patenting for a subset of software firms.**
- **Undertake “differences-in-differences” analysis:**
  - **Do affected firms differ in patenting propensity?**
  - **Do they differ in other measures of innovation?**

Lotus-Borland case: Backdrop

- **Lingering uncertainties about breadth of copyright protection for software:**
  - **Whelan v. Jaslow, 1986:**
    - **Program in EDL found to infringe one in BASIC.**
    - **Infringement because similarities in functionality and structure.**
  - **Lotus v. Paperback Software and Mosaic Software, 1990:**
    - **Defined “look and feel” test.**
  - **Computer Associates v. Altai, 1991:**
    - **Whelan’s “structure, sequence, and organization” test “inadequate and inaccurate.”**

The case

- **Lotus sued Borland in July 1990:**
  - **Quatro program alleged to infringe in several ways:**
    - **Menu commands.**
    - **Menu structure.**
    - **Long prompts.**
    - **Keystroke sequences.**
    - **Macro language.**

Rulings

- **July 1992: Federal District court in Massachusetts rules for Lotus:**
  - **Summary judgment on menu commands.**
- **March 1995: Court of Appeals for First Circuit reverses:**
  - **Menu is “method of operation” and not copyrightable.**
- **January 1996: Equally divided Supreme Court affirms appellate decision.**

Interpretations

- **Not completely unclouded!**
  - **Supreme Court had a chance to make a clear decision and did not.**
  - **Limited scope.**
- **But widely seen as reducing attractiveness of copyright, if only because of ambiguities.**
  - **Anecdotally, increased interest in patenting as a result.**

Methodology

- **Look at patenting and measures of firm activity before and after Lotus decisions**
  - **1994 and before vs. 1996 and after.**
- **Look at impact on firms which are and are not in categories where interfaces likely to be important:**
  - **Use an event study around the announcements of the judicial decisions to identify interface firms and non-interface firms**

The data

- **CorpTech data.**
- **Patent data.**
- **Compustat data:**
  - **For selected analyses.**
- **CRSP data.**
- **VentureXpert data.**

The results

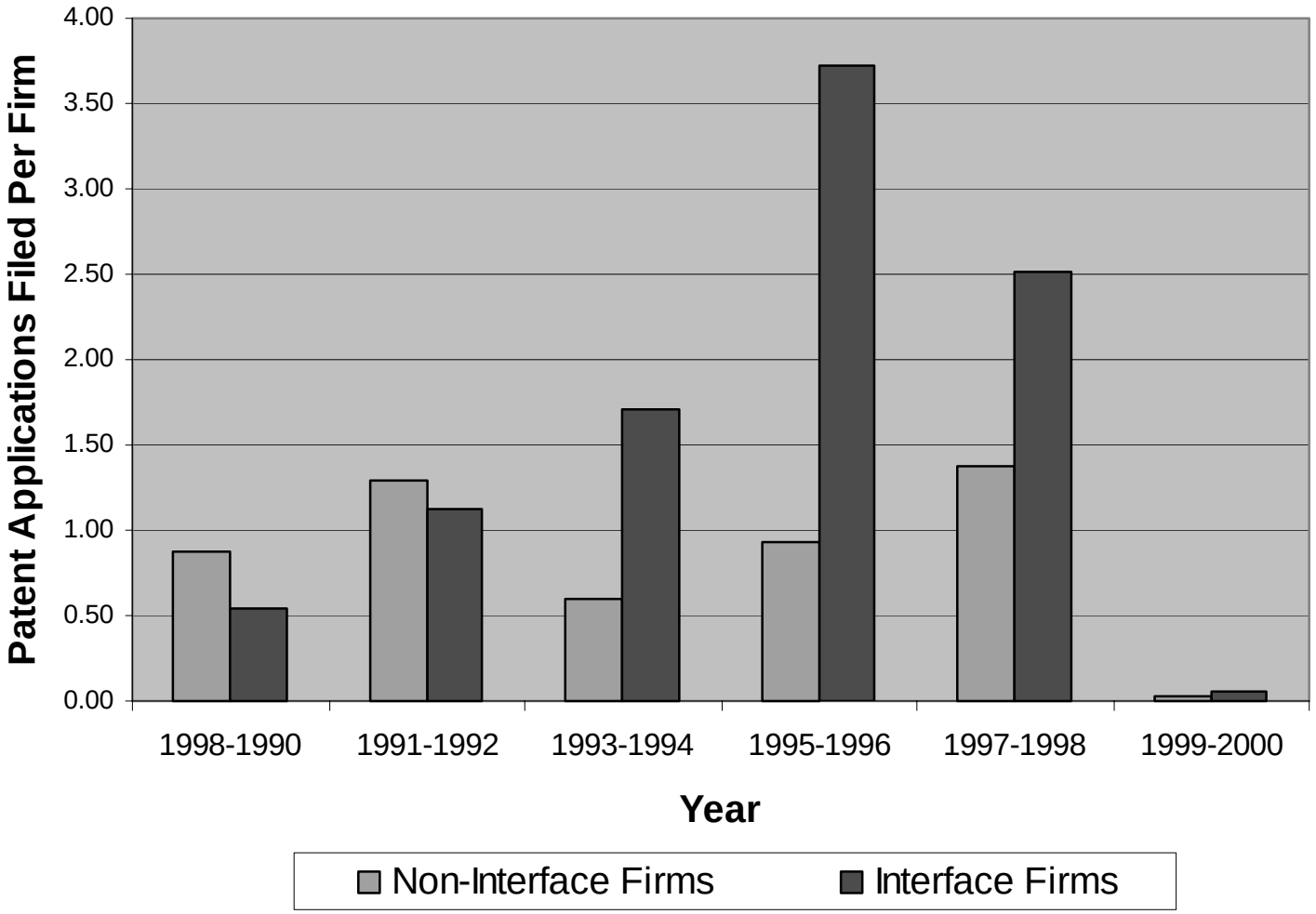
- **Considerable patenting response:**
  - **Increase in interface firms outstrips other software firms.**
- **No harmful effects from the judicial decision:**
  - **The increased reliance on patent protection is correlated with significant growth in firm sales, number of employees, market capitalization, sales per employee and number of business lines.**

Identifying Interface Firms

- **A priori scheme:**
  - **Rely on industry knowledge to classify the firms.**
- **A more object approach:**
  - **Use the actual (or absolute) return of each public firm in a window around each of the three judicial decisions as the dependent variable.**
  - **Use dummy variables denoting the 359 distinct technology classes as independent variables.**
  - **Divide technology classes into “strong”, “median” and “unaffected” groups.**
  - **Define (un)affected firms based on their technological classification.**

We had considerable degree of overlap across the different schemes, including our a priori scheme.

Considerable patenting increase



	Poisson	Poisson	Poisson	OLS	Negative Binomial
interface	-1.069	-.991	-1.119	-.023	-.714
	[.034]***	[.033]***	[.034]***	[.010]**	[.403]*
interface* year1996	3.869	2.329	2.712	.029	1.006
	[.075]***	[.078]***	[.082]***	[.015]**	[.562]*
interface* year1998	2.148	1.505	1.695	.031	1.221
	[.055]***	[.049]***	[.051]***	[.014]**	[.580]**
Year 1994	-1.546	-1.508	-1.494	.002	.837
	[.039]***	[.039]***	[.040]***	[.009]	[.393]**
Year 1996	-2.484	-2.559	-2.850	-.010	.794
	[.071]***	[.070]***	[.074]***	[.014]	[.516]
Year 1998	-1.860	-1.194	-1.199	-.013	.248
	[.049]***	[.041]***	[.045]***	[.013]	[.546]
Age of the firm	-.021	.011	.007	.001	-.016
	[.001]***	[.001]***	[.001]***	[.000]**	[.010]
Lagged value of sales	.000	.000	.000	.000	.003
	[.000]***	[.000]***	[.000]***	[.000]***	[.001]***
Lagged total number of patents applied		.002	.002	.003	.076
		[.000]***	[.000]***	[.000]***	[.021]***
Entry rate	-1.324		1.392	.036	2.914
	[.090]***		[.097]***	[.030]	[1.425]**
Observations	*12085*	*12122*	*12085*	*12085*	*12085*
R-squared	*0.09*	*0.52*	*0.52*	*.40*	*0.13*

	Sales Growth	Sales Growth	Total Asset Growth	Total Asset Growth
Year 1994	-0.593	0.071	-13.864	-25.743
	[1.166]	[1.002]	[16.368]	[30.151]
Year 1996	7.714	5.334	-0.973	-2.932
	[2.065]***	[1.756]***	[27.365]	[54.078]
Year 1998	-0.754	-0.470	-5.007	-10.347
	[2.071]	[1.732]	[22.638]	[44.855]
interface	-0.126	0.462	14.912	26.857
	[1.196]	[1.073]	[14.561]	[29.682]
interface*year1996	-7.685	-6.920	-14.316	-25.072
	[2.389]***	[2.251]***	[31.550]	[60.372]
interface*year1998	1.598	-24.090	-11.683	-22.735
	[2.413]	[2.905]***	[26.533]	[53.224]
Age of the firm	0.103	0.105	0.175	0.540
	[0.044]**	[0.039]***	[0.293]	[0.684]
Entry rate	1.813	-7.882	-28.524	-63.675
	[4.496]	[4.096]*	[51.740]	[105.794]
Lagged predicted number of patents		0.000		0.000
		[0.000]		[0.000]
interface * year1996 * lagged predicted number of patents		12.274		-0.004
		[5.032]**		[0.075]
interface * year1998 * lagged predicted number of patents		36.551		0.852
		[2.953]***		[15.865]
Lagged total asset			-0.058	-0.078
			[0.185]	[0.381]
Lagged value of sales	-0.119	-0.119		
	[0.234]	[0.174]		
Observations	*12473*	*7108*	*2372*	*1262*
R-squared	*0.00*	*0.03*	*0.00*	*0.01*

	Market Cap Growth	Market Cap Growth	Employees Growth	Employees Growth	Sales per employee Growth	Sales per employee Growth
Year 1994	-1.116	-1.627	0.075	0.036	-0.488	0.312
	[0.967]	[1.686]	[0.407]	[0.242]	[1.033]	[0.162]*
Year 1996	-0.761	-1.926	0.030	-0.136	2.325	0.380
	[1.617]	[3.058]	[0.652]	[0.389]	[1.754]	[0.272]
Year 1998	-1.701	-3.397	1.655	0.153	0.115	0.230
	[1.300]	[2.449]	[0.597]***	[0.357]	[1.619]	[0.252]
interface	-0.632	-1.880	0.154	0.203	0.842	0.096
	[0.842]	[1.608]	[0.415]	[0.258]	[0.993]	[0.162]
interface*year1996	1.534	2.564	0.198	-1.427	-3.133	-0.225
	[1.866]	[3.408]	[0.751]	[0.496]***	[2.023]	[0.350]
interface*year1998	1.870	-1.317	-1.478	-1.203	-0.540	-0.531
	[1.524]	[2.900]	[0.683]**	[0.709]*	[1.886]	[0.528]
Age of the firm	-0.011	-0.038	-0.005	-0.011	-0.037	-0.004
	[0.016]	[0.036]	[0.015]	[0.008]	[0.036]	[0.006]
Entry rate	-1.882	-5.880	-1.365	0.187	1.405	(dropped)
	[3.003]	[5.654]	[1.467]	[0.924]	[3.753]	
Lagged predicted number of patents		0.000		0.030		0.000
		[0.000]		[0.039]		[0.000]
interface * year1996 * lagged predicted number of patents		0.001		7.587		0.651
		[0.004]		[1.085]***		[0.762]
interface * year1998 * lagged predicted number of patents		5.580		1.846		1.377
		[0.836]***		[0.826]**		[0.623]**
Lagged sales per employee					-0.030	-0.012
					[0.145]	[0.017]
Lagged number of employees			0.000	0.000		
			[0.000]***	[0.000]***		
Lagged market cap	-0.009	-0.034				
	[0.010]	[0.018]*				
Observations	*2080*	*1124*	*11031*	*6653*	*9341*	*5530*
R-squared	*0.00*	*0.04*	*0.00*	*0.01*	*0.00*	*0.01*

	R&D Growth	R&D Growth	Product Line Growth	Product Line Growth	Get First Round Finance	Get First Round Finance
Year 1994	-0.169	0.162	-0.038	0.016	0.091	0.347
	[0.112]	[0.108]	[0.018]**	[0.026]	[0.102]	[0.191]*
Year 1996	-0.028	0.003	-0.014	0.018	0.102	0.372
	[0.166]	[0.182]	[0.029]	[0.044]	[0.146]	[0.268]
Year 1998	-0.267	-0.177	-0.020	0.019	0.368	0.544
	[0.146]*	[0.161]	[0.026]	[0.039]	[0.124]***	[0.274]**
interface	-0.066	-0.141	0.396	0.372	0.014	-0.056
	[0.092]	[0.104]	[0.018]***	[0.028]***	[0.096]	[0.206]
interface * year1996	0.182	0.433	0.025	-0.003	0.041	-0.040
	[0.197]	[0.206]**	[0.035]	[0.050]	[0.175]	[0.296]
interface * year1998	0.091	0.258	-0.028	-0.024	0.060	0.189
	[0.172]	[0.191]	[0.031]	[0.054]	[0.145]	[0.335]
Age of the firm	-0.009	-0.006	0.002	0.002	-0.028	-0.012
	[0.002]***	[0.003]**	[0.001]***	[0.001]**	[0.005]***	[0.008]
Entry rate	0.244	-0.298	0.065	0.207	0.434	2.064
	[0.311]	[0.387]	[0.063]	[0.100]**	[0.258]*	[0.577]***
Lagged predicted number of patents		0.000		0.000		0.000
		[0.000]		[0.000]**		[0.000]
interface * year1996 * lagged predicted number of patents		0.000		0.003		0.000
		[0.000]		[0.000]***		[0.010]
interface * year1998 * lagged predicted number of patents		-0.009		0.017		-0.006
		[0.052]		[0.041]		[0.249]
Lagged number of product lines			-0.049	-0.045		
			[0.002]***	[0.002]***		
Lagged R&D	0.000	0.000				
	[0.000]***	[0.000]*				
Observations	*2580*	*1032*	*25707*	*12245*	*31792*	*11439*
R-squared	*0.02*	*0.03*	*0.05*	*0.07*	*0.04*	*0.05*

Robustness Checks

- **Use other definitions for interface firms.**
- **Different scheme to classify firms as interface firms:**
  - **Interface firms: > 50% business lines are affected.**
- **Firms providing enterprise software or non-enterprise software:**
  - **Eliminate all firms whose products run on mainframe computers.**
  - **We find that firms targeting at enterprises are less responsive to the judicial decision.**
- **The World Wide Web in the mid-1990s:**
  - **Eliminate all firms geared towards the Internet**

We obtain similar results.

Conclusions

- **The judicial decision appears to have had a considerable impact on patenting.**
- **Little evidence can be found for any harmful affects from the policy shift.**
- **The increased reliance on patent protection appears to be correlated with significant growth in a number of performance measures.**