

“Patent trolls And The Market For Acquisitions”
Internet Appendix: Supplemental Figures And Tables

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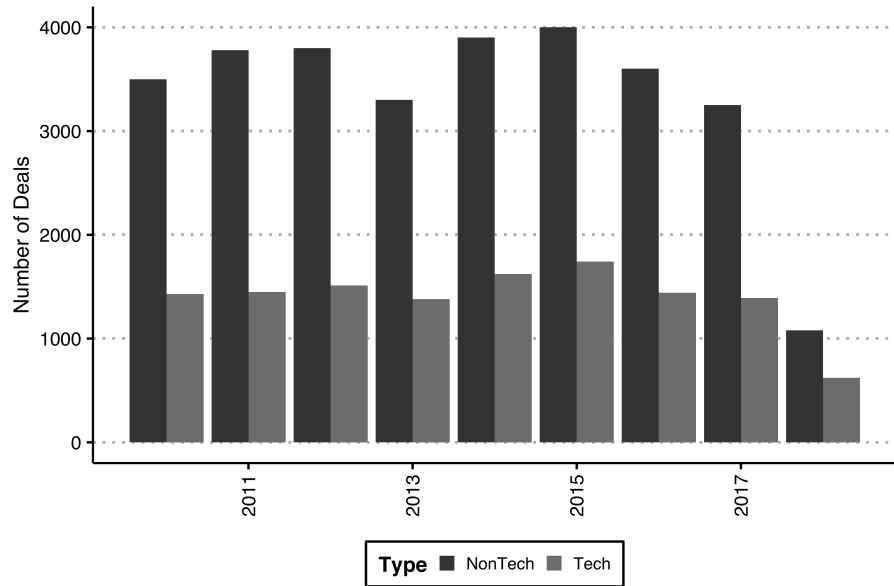


Figure IA1. The Number of Acquisitions Across Years

This figure plots the number of tech and non-tech acquisitions between the first quarter of 2010 and the first quarter of 2018. Acquisitions in the sample are assigned to a given year based on the date of the acquisition announcement. 2018 only includes acquisitions in the first quarter.

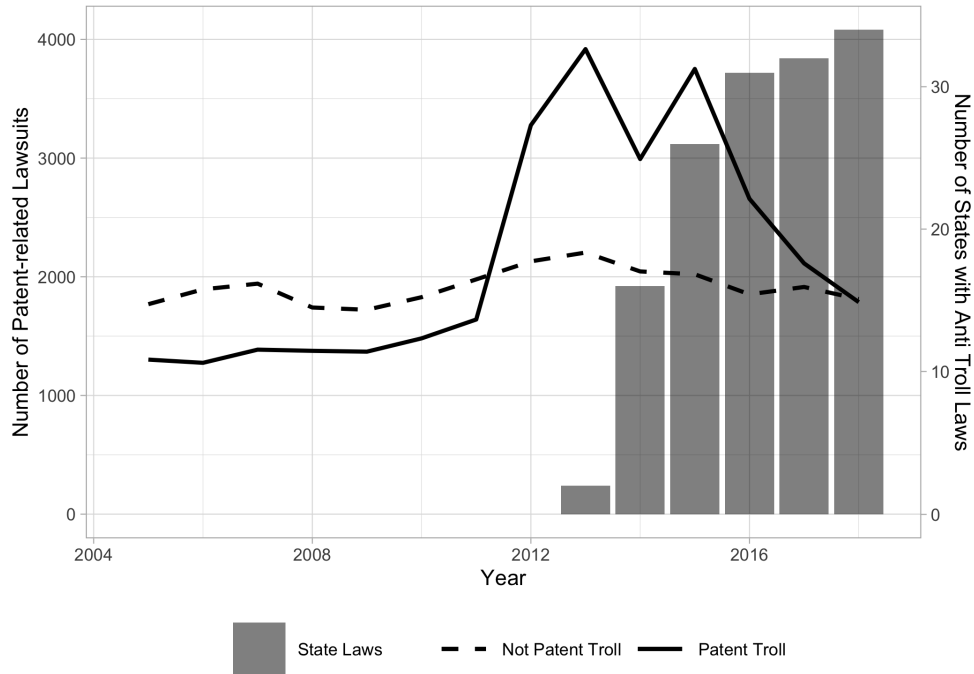
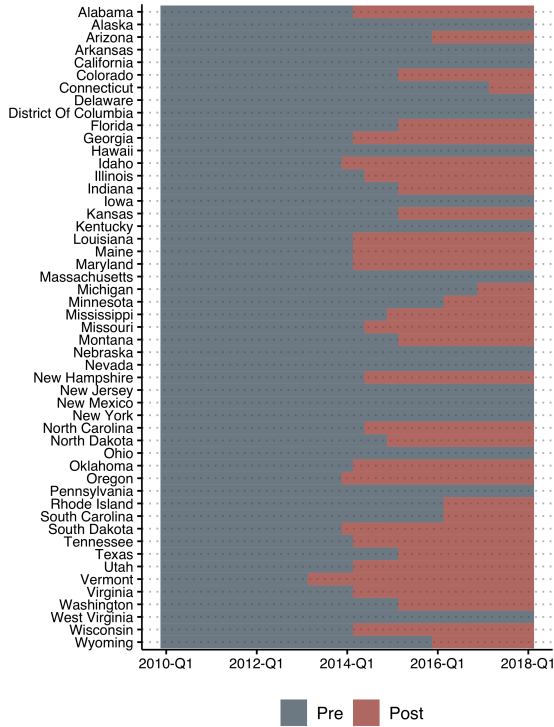
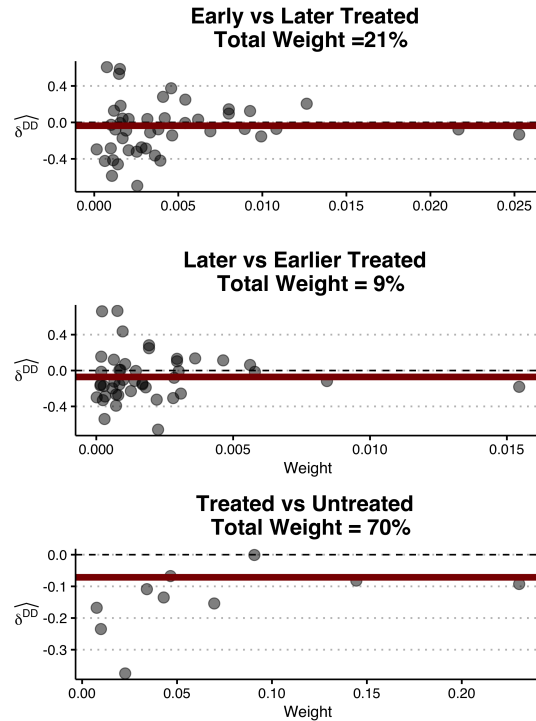


Figure IA2. Time Series of Patent-related Litigation and Anti-troll Laws

This figure plots the number of patent-related lawsuits filed by Patent Trolls and Non-Patent Trolls at U.S. District Courts (right axis) and the number of states that have anti-troll laws in place (left axis) from the beginning of 2000 to the end of 2017. The data on patent-related litigation is from The Stanford Non-Practicing Entity (NPE) Litigation Database. The Database comprehensively tracks all patent-related lawsuits filed at U.S. District Courts and provides detailed categorization to determine whether the plaintiff is a patent troll.



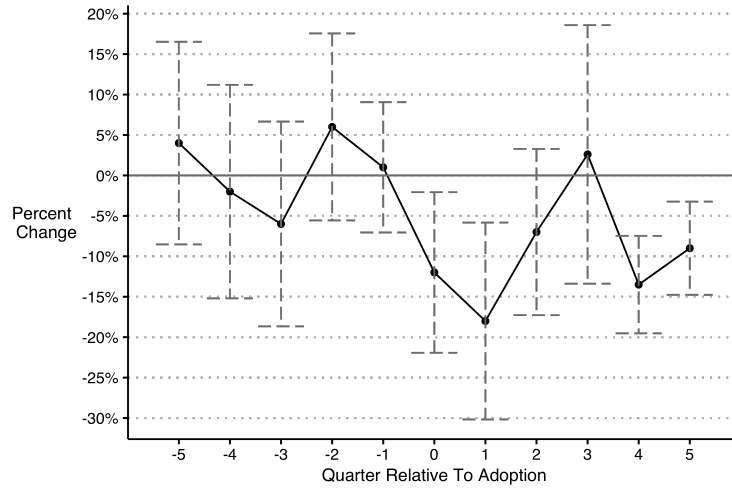
((a)) Timing of Adoption



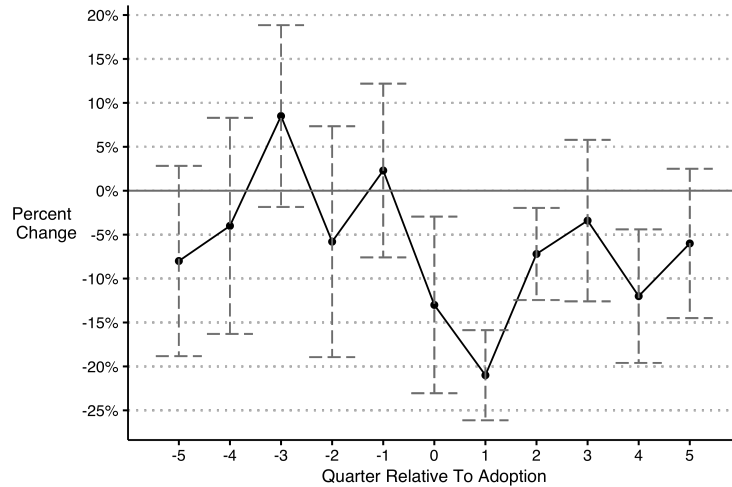
((b)) Goodman-Bacon Decomposition

Figure IA3. Goodman-Bacon Diagnostics Test

This figure decomposes the aggregate treatment effect of the anti-troll laws into its three components using Goodman-Bacon Decomposition Diagnostic (Goodman-Bacon, 2021). Panel (a) visually portrays the variation in timing of the adoption of the anti-troll laws. Panel (b) plots the weights and 2×2 DiD estimates for each treatment timing cohort, broken down by *Early vs. Later Treated*, *Later vs. Earlier Treated*, and *Treated vs. Untreated* states. Each circle is a unique comparison between treatment timing cohorts (e.g., states treated in 2014 compared to states treated in 2017), and the bold red line represents the weighted average within each comparison type. The overall Average Treatment Effect is the weighted sum of each weighted average.



((a)) Stacked Regression Event Study



((b)) Callaway and SantAnna (2020)

Figure IA4. Alternative Estimation of The Dynamic Effect of Anti-troll Laws on Acquisition Activities

This figure plots the evolution of acquisition activity in tech industries in states with anti-troll laws relative to states without such laws Using the Stacked Regression Estimator (Panel (a)) and using Callaway and SantAnna (2020) estimator (Panel (b)). In Panel (a), I estimate Equation 3, except that I replace the Anti-Troll Law indicator with indicators that identify quarters $t-5$, to $t+5$ for states that pass an anti-troll law, where quarter t is the quarter the anti-troll law is signed. In Panel (b), I use the dynamic aggregation approach in Callaway and SantAnna (2020) that aggregates the effect at each quarter relative to the treatment event (adoption of the law) across all states. The graph shows the point estimates associated with each of these indicators along with the 95% confidence interval where robust standard errors are clustered by state.

Table IA1

Signing Dates of State Anti-troll Laws

This table lists the 35 states with anti-troll laws as of the beginning of 2018.

State	Law Signed
AL	4/2/2014
AZ	3/24/2016
CO	6/5/2015
CT	5/8/2017
FL	6/2/2015
GA	4/15/2014
ID	3/26/2014
IL	8/26/2014
IN	5/5/2015
KS	5/20/2015
LA	5/28/2014
ME	4/14/2014
MD	5/5/2014
MI	1/6/2017
MN	4/29/2016
MS	3/28/2015
MO	7/8/2014
MT	4/2/2015
NH	7/11/2014
NC	8/6/2014
ND	3/26/2015
OK	5/16/2014
OR	3/3/2014
RI	6/4/2016
SC	6/9/2016
SD	3/26/2014
TN	5/1/2014
TX	6/17/2015
UT	4/1/2014
VT	5/22/2013
VA	5/23/2014
WA	4/25/2015
WI	4/24/2014
WY	3/11/2016

Table IA2
Robustness Tests for The Number of Acquisitions

The dependent variable, $\ln(1 + \text{numberofdeals})_{st}$, is equal to the natural log of one plus the number of acquisition deals in state s during quarter t . Geographic location is determined based on the location of the target and quarter is determined by the announcement date of the deal. *Anti – Troll Law* is a dummy variable taking a value of 1 at time t for a given state if the state has passed the law at any time before t . In weighted OLS regressions, the number of acquisitions in the first quarter of the sample in each state is used. Control variables are state GDP, state per capita income, and a dummy variable for other state initiatives to promote innovation and small businesses. Control variables are included in the regressions but not reported for brevity. State and year-quarter fixed effects are included in all tests. Standard errors are clustered by state.***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Annual Regressions			Weighted Regressions			California Excluded			California and Texas Excluded		
	All Deals	Tech	Non-Tech	All Deals	Tech	Non-Tech	All Deals	Tech	Non-Tech	All Deals	Tech	Non-Tech
Anti-Troll Law	-0.062*	-0.140**	-0.026	-0.038	-0.065**	-0.018	-0.056*	-0.083**	-0.026	-0.053	-0.083*	-0.023
	(0.095)	(0.032)	(0.509)	(0.161)	(0.018)	(0.599)	(0.092)	(0.049)	(0.399)	(0.108)	(0.053)	(0.469)
# of Deals	42,631	12,364	30,267	42,631	12,364	30,267	42,631	12,364	30,267	42,631	12,364	30,267
# of State-Quarters	459	459	459	1,650	1,518	1,584	1,650	1,650	1,650	1,617	1,617	1,617
R-squared	0.974	0.938	0.967	0.960	0.914	0.940	0.904	0.828	0.882	0.896	0.816	0.872
State FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Table IA3
Identification Tests for Acquisition Price Ratios

The dependent variable, $PriceRatio_{ist}$, is the value of the deal divided by the target's latest available book value of assets. *Anti-Troll Law* is a dummy variable taking a value of 1 at time t for a given state if the state has passed the law at any time before t . *Neighbor Law* is a dummy variable taking value of 1 at time t for a given state if the state has not passed the law but has at least one neighboring state that has passed the law at any time before t . Control variables are state GDP, state per capita income, and a dummy variable for other state initiatives to promote innovation and small businesses. Control variables are included in the regressions but not reported for brevity. State and year-quarter fixed effects are included in all tests. Standard errors are clustered by state.***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	California Excluded				Neighbor Law				Treatment T-12			
	All	All	Small	Small	All	All	Small	Small	All	All	Small	Small
Anti-Troll Law	-0.708 (0.199)	-1.296*** (0.009)	-1.025 (0.146)	-1.696** (0.023)	-1.383** (0.042)	-1.905*** (0.003)	-1.195* (0.062)	-1.905*** (0.003)	-0.512 (0.285)	-1.047** (0.018)	-0.554 (0.351)	-1.089* (0.094)
Neighbor					-0.723 (0.152)	-0.671 (0.128)	-0.347 (0.537)	-0.671 (0.128)				
Anti-Troll Law*Tech		1.845*** (0.003)		2.647*** (0.004)		1.916*** (0.002)		1.916*** (0.002)		1.542* (0.054)		1.670* (0.070)
Neighbor Law*Tech						0.250 (0.609)		0.250 (0.609)				
Tech		1.160*** (0.000)		0.959** (0.013)		1.099*** (0.000)		1.099*** (0.000)		1.073*** (0.000)		0.621** (0.012)
Anti-Troll Law t-12									-0.945** (0.022)	-1.013** (0.032)	-0.884 (0.117)	-1.131* (0.064)
Anti-Troll Law t-12*Tech										0.419 (0.551)		1.366 (0.110)
# of Deals	1,124	1,124	565	565	1,367	1,367	690	1,367	1,367	1,367	690	690
R-squared	0.111	0.144	0.177	0.211	0.102	0.132	0.158	0.132	0.104	0.135	0.161	0.193
State FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Table IA4
Alternative Estimation of The Effect of Anti-troll Laws
on Acquisition Price Ratios of Independent Targets

The dependent variable, $PriceRatio_{ist}$, is the value of the deal divided by the target's book value of assets. *Anti – Troll Law* is a dummy variable taking a value of 1 at time t for a given state if the state has passed the law at any time before t . *Tech* is a dummy variable indicating that the target belongs to a high-tech industry. *Small* is a dummy variable indicating the size of the target is below \$50 million. The stacked regression estimator stacks cohort-specific (*Group*) datasets that include observations from states that adopt the law in a certain quarter, and all states that do not adopt within 10 quarters. The stacked regressions include the interaction of cohort-specific event date with both calendar date and states as two sets of Fixed Effects. These FEs are analogous to state and time FEs in TWFE specification. Control variables are state GDP, state per capita income, and a dummy variable for other state initiatives to promote innovation and small businesses. Control variables are included in the regressions but not reported for brevity. Standard errors are clustered by state.***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)
	All Targets	All Targets	Small Targets	Small Targets
Anti-Troll Law	0.976 (0.287)	-0.167 (0.855)	0.955 (0.287)	-0.269 (0.776)
Anti-Troll Law*Tech		2.997*** (0.001)		3.097** (0.024)
Tech		0.270* (0.087)		0.227** (0.046)
# of Deals	919	919	511	511
R-squared	0.248	0.260	0.409	0.416
State \times Group FE	YES	YES	YES	YES
Time \times Group FE	YES	YES	YES	YES

Table IA5
The Effect of Anti-troll Laws on Other Aspects of
Acquisitions of Non-independent Targets

The dependent variables are $Completion_{ist}$, a dummy variable taking a value of 1 if an announced acquisition is completed, $Time\ to\ Complete_{ist}$, the natural log of one plus the number of days between announcement and completion of the acquisition, and $Non - Cash_{ist}$, a dummy variable taking value of 1 if the e target accepts a payment method that involves a non-cash payment (partially or fully) and takes a value of 0 if payment is only cash. All columns with binary dependent variables are Linear Probability Models. *Anti - Troll Law* is a dummy variable taking a value of 1 at time t for a given state if the state has passed the law at any time before t . *Tech* is a dummy variable indicating the target belongs to a high-tech industry. *Small* is a dummy variable indicating the size of the target is below \$50 million. Non-independent targets are subsidiaries of other companies sold in the transaction. Control variables are state GDP, state per capita income, and a dummy variable for other state initiatives to promote innovation and small businesses. Control variables are included in the regressions but not reported for brevity. State and year-quarter fixed effects are included in all tests. Standard errors are clustered by state.***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	All Deals			Small Deals		
	Completion	Time to Complete	Non-Cash	Completion	Time to Complete	Non-Cash
Anti-Troll Law	0.006 (0.265)	-1.347 (0.642)	-0.015 (0.211)	-0.002 (0.813)	-2.264 (0.180)	-0.006 (0.564)
Anti-Troll Law*Tech	-0.006 (0.157)	1.754 (0.559)	-0.01 (0.610)	-0.005 (0.607)	2.17 (0.405)	0.002 (0.943)
Tech	0.011*** (0.002)	2.645** (0.018)	0.028*** (0.001)	0.001 (0.868)	-0.108 (0.932)	0.058*** (0.000)
# of Deals	23,893	24,607	16,294	8,425	8,643	8,631
R-squared	0.010	0.003	0.026	0.016	0.009	0.028
State FE	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES

Table IA6
Alternative Estimation of The Effect of Anti-troll Laws
on Other Aspects of Acquisitions

The dependent variables are $Completion_{ist}$, a dummy variable taking a value of 1 if an announced acquisition is completed, $Time\ to\ Complete_{ist}$, the natural log of one plus the number of days between announcement and completion of the acquisition, and $Non - Cash_{ist}$, a dummy variable taking value of 1 if the e target accepts a payment method that involves a non-cash payment (partially or fully) and takes a value of 0 if payment is only cash. $Anti - Troll\ Law$ is a dummy variable taking a value of 1 at time t for a given state if the state has passed the law at any time before t . $Tech$ is a dummy variable indicating the target belongs to a high-tech industry. $Small$ is a dummy variable indicating the size of the target is below \$50 million. All columns with binary dependent variables are Linear Probability Models. The estimation uses the Stacked Regression Estimator. The stacked regression estimator stacks cohort-specific ($Group$) datasets that include observations from states that adopt the law in a certain quarter, and all states that do not adopt within 10 quarters. The stacked regressions include the interaction of cohort-specific event date with both calendar date and states as two sets of Fixed Effects. These FEs are analogous to state and time FEs in TWFE specification. Control variables are state GDP, state per capita income, and a dummy variable for other state initiatives to promote innovation and small businesses. Control variables are included in the regressions but not reported for brevity. Standard errors are clustered by state.***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

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	(1)	(2)	(3)	(4)	(5)	(6)
	All Deals			Small Deals		
	Completion	Time to Complete	Non-Cash	Completion	Time to Complete	Non-Cash
Anti-Troll Law	0.009 (0.269)	3.291 (0.373)	0.019 (0.242)	0.014 (0.422)	2.339 (0.930)	0.039 (0.234)
Anti-Troll Law*Tech	-0.009* (0.065)	2.187* (0.051)	0.036* (0.061)	-0.032** (0.021)	1.978* (0.066)	0.061** (0.039)
Tech	0.006** (0.018)	1.056 (0.319)	0.101*** (0.000)	0.019*** (0.006)	-2.935* (0.075)	0.113*** (0.000)
# of Deals	39,490	37,624	14,578	6,643	6,160	6,153
R-squared	0.012	0.064	0.044	0.041	0.051	0.058
State \times Group FE	YES	YES	YES	YES	YES	YES
Time \times Group FE	YES	YES	YES	YES	YES	YES

Table IA7
Alternative Estimation Of The Effect of Anti-troll Laws
on Acquirers' Cumulative Abnormal Returns around
Acquisition Announcements

The dependent variable, $CAR(-1, +1)$, is calculated as the daily returns in excess of the market model in a 3-day window around the announcement of the acquisition. The parameters for the market model are estimated using daily returns from $t-250$ to $t-20$. *Anti-Troll Law* is a dummy variable taking a value of 1 at time t for a given state if the state has passed the law at any time before t . *Tech* is a dummy variable indicating the target belongs to a high-tech industry. The estimation uses the Stacked Regression Estimator. The stacked regression estimator stacks cohort-specific (*Group*) datasets that include observations from states that adopt the law in a certain quarter, and all states that do not adopt within 10 quarters. The stacked regressions include the interaction of cohort-specific event date with both calendar date and states as two sets of Fixed Effects. These FEs are analogous to state and time FEs in TWFE specification. Control variables are a dummy variable indicating that the firm is cash rich, past annual returns, natural logarithm of market cap, leverage ratio, boot-to-market ratio, and free cash flow. Control variables are not reported for brevity. Standard errors are clustered by state. State and year-quarter fixed effects are included in all tests. Standard errors are clustered by state. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	All Deals	Cash Deals	All Deal > \$50m	Cash Deal > \$50m	All Deal > %1	Cash Deal > %1
Anti-Troll Law	0.043 (0.415)	0.001 (0.895)	-0.009 (0.589)	0.011 (0.266)	0.055 (0.578)	0.008 (0.457)
Anti-Troll Law *Tech	-0.006 (0.652)	-0.008 (0.189)	0.018* (0.089)	-0.020* (0.054)	-0.051* (0.089)	-0.024*** (0.006)
Tech	0.001 (0.852)	-0.010*** (0.000)	-0.003 (0.437)	-0.023*** (0.000)	-0.004 (0.268)	-0.016*** (0.000)
Observations	6,195	3,445	2,046	1,395	3,018	2,093
R-squared	0.027	0.054	0.113	0.168	0.065	0.110
State \times Group FE	YES	YES	YES	YES	YES	YES
Year \times Group FE	YES	YES	YES	YES	YES	YES

Table IA8
The Effect of Anti-troll Laws on Public Companies’
R&D Expenditures

The dependent variable, $R\&D_{ist}$, is the natural log of one plus R&D expenditure for company i located in state s at year t as reported in Compustat. *Anti – Troll Law* is a dummy variable taking a value of 1 at time t for a given state if the state has passed the law at any time before t . *Tech* is a dummy variable indicating the target belongs to a high-tech industry. Control variables are natural logarithm of sales, firm age, leverage ratio, profitability, tangibility, free cash flow, and Herfindahl index. Control variables are not reported for brevity. State and year-quarter fixed effects are included in all tests. Standard errors are clustered by state. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)
	All Firms	All Firms	Sale<100	assets<200	RD>0
Anto-Troll Law	-0.213*** (0.001)	-0.061*** (0.001)	-0.299*** (0.000)	-0.094 (0.182)	-0.074 (0.138)
Anto-Troll Law*Tech	0.338** (0.011)	0.055* (0.061)	0.282** (0.044)	0.176* (0.086)	0.157* (0.082)
Tech	1.406*** (0.000)		0.658*** (0.000)	0.680*** (0.000)	0.680*** (0.000)
Constant	-0.931*** (0.000)	0.229 (0.289)	0.913*** (0.000)	0.965*** (0.000)	-1.136*** (0.000)
# of Observations	12,932	12,932	3,434	4,193	8,954
R-squared	0.468	0.986	0.462	0.461	0.719
State FE	YES	NO	YES	YES	NO
Firm FE	NO	YES	NO	NO	YES
Time FE	YES	YES	YES	YES	YES

Table IA9
Alternative Estimation Of The Effect of Anti-troll Laws
on Public Companies' R&D Expenditures

The dependent variable, $R\&D_{ist}$, is the natural log of one plus R&D expenditure for company i located in state s at year t as reported in Compustat. *Anti – Troll Law* is a dummy variable taking a value of 1 at time t for a given state if the state has passed the law at any time before t . *Tech* is a dummy variable indicating the target belongs to a high-tech industry. The estimation uses the Stacked Regression Estimator. The stacked regression estimator stacks cohort-specific (*Group*) datasets that include observations from states that adopt the law in a certain quarter, and all states that do not adopt within 10 quarters. The stacked regressions include the interaction of cohort-specific event date with both calendar date and states as two sets of Fixed Effects. These FEs are analogous to state and time FEs in TWFE specification. Control variables are natural logarithm of sales, firm age, leverage ratio, profitability, tangibility, free cash flow, and Herfindahl index. Control variables are included in the regressions but not reported for brevity. Standard errors are clustered by state. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)
	All Firms	All Firms	Sale<100	assets<200	RD>0
Anti-Troll Law	-0.086*	-0.023*	-0.283**	-0.147	-0.026
	(0.095)	(0.063)	(0.027)	(0.150)	(0.775)
Anti-Troll Law*Tech	0.125**	0.047**	0.385**	0.231*	0.139**
	(0.036)	(0.014)	(0.025)	(0.074)	(0.023)
Tech	1.423***		0.919***	0.901***	0.251***
	(0.000)		(0.000)	(0.000)	(0.005)
# of Observations	10,666	10,666	2,587	3,234	6,074
R-squared	0.186	0.996	0.255	0.273	0.093
State × Group FE	YES	NO	YES	YES	NO
Firm × Group FE	NO	YES	NO	NO	YES
Time × Group FE	YES	YES	YES	YES	YES