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Examining the Value of Small Entity Patents

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Patent System and "Small" Inventors

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Who files patent applications?

- At beginning, independent inventor focused/dominated
- Shifts overtime to large corporations
- Recent recognition of lack of participation by individual inventors and small companies

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Assumptions behind recent focus

- Benefits individual inventors (and their small companies)
  - exclusivity (“shelf space”)
  - commercialization/access to capital
  - signaling
- Benefits society
  - pioneering breakthroughs
  - targets under addressed problems
- Equity/Equality

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Patent Fee Reduction for Small Entities

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Fee reduction by inventor "size"

- **1983** – halved both filing fees and maintenance fees for independent inventors, small businesses (per SBA definition), and non-profits
- **1999** – American Inventor's Protection Act (AIPA) defines "small entity"
  - < 500 employees & not assigned patent rights to large entities
  - independent inventors and non-profits
- **2013** – American Invents Act (AIA) introduces "micro entity", reduction by 75%
  - gross income < 3x median household incomes
  - < 4 patent/patent applications
  - university scientists

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Why did US reduce fees?

- Increase participation to benefit small inventors
- Equity
- Sound familiar?

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Study Design to Test Value Assumptions

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Leverage small entity designation

- Patent applicant selects “small” or “micro” when filing application
  - must update designation

- Designation is publicly available for all published and issued patent applications

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Study tests "value" of issued patents

- Assumption that patenting is "good" for small entities
  - Beneficial to them (private value)
  - Beneficial for us (public value)

- Some prior research using designation information
  - Breitzman (2009, 2013) (limited case studies)
  - Lerner, Speen, Leamon (2015) (AIA first to file)
  - Farre-Mensa, Hegde, & Ljungqvist (2020) (funding)
  - Allison, Moore, Lemley, & Turnkey (2004) (litigation)

- Surprisingly under explored

Evidence of Private Value?

Maintenance

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Patent maintenance

- To maintain a U.S. patent's enforceability, must pay "maintenance fees"
  - Payments due at 4, 8, and 12 years after patent issuance date
  - Patent term of enforceability is 20 years from filing date

- Cost increases exponentially for each maintenance stage
  - Reduced based on entity size at time of maintenance

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Maintenance and private value

- Payment indicator of private value to patent owner
  - Commonly used as such in literature

- Compare payment rates between large and small entities
  - Pick patents that could reach each maintenance stage (2000 to 2011)
  - Variation in fee should compensate for entity-size difference

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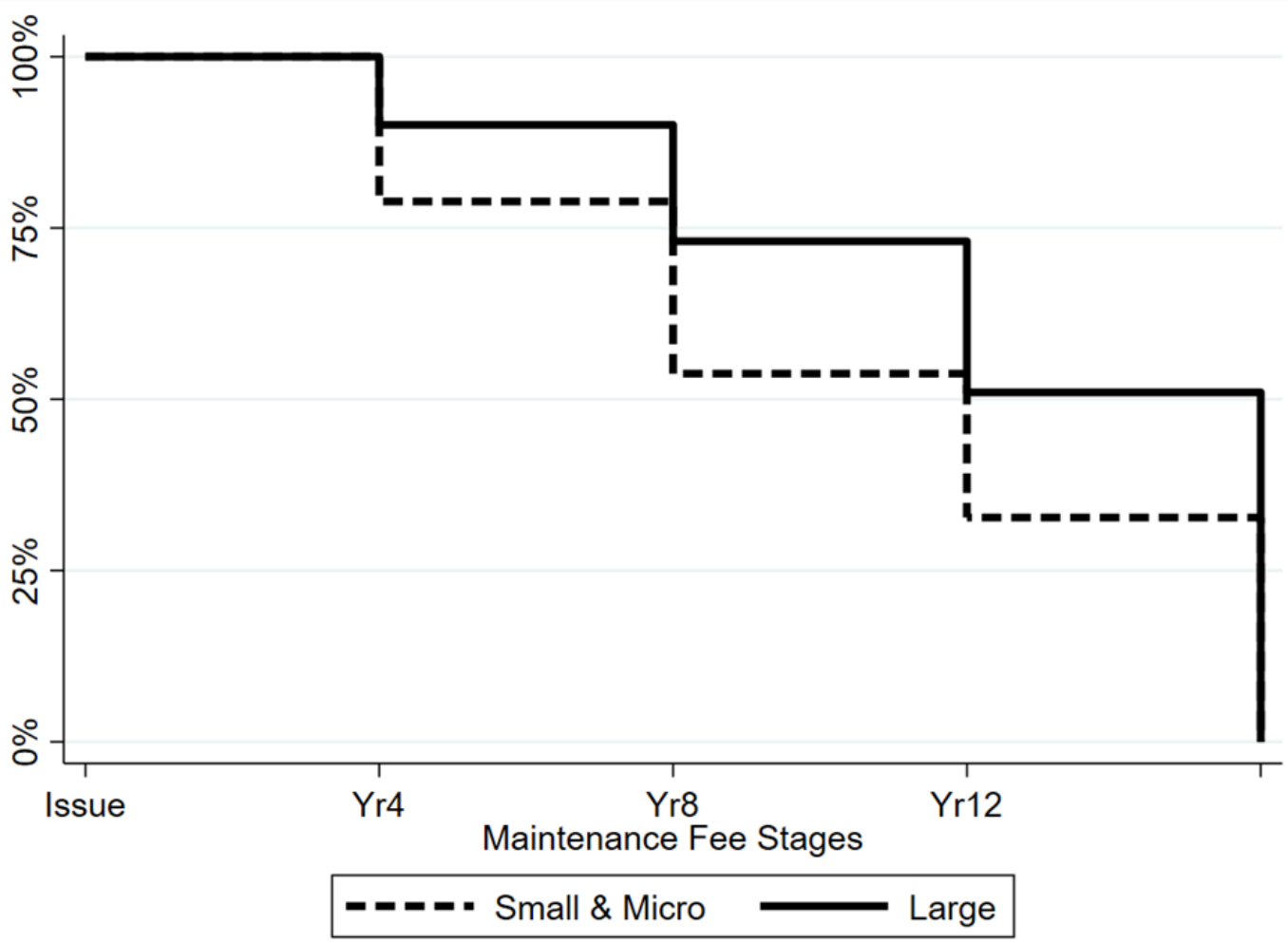
Survival Estimates for All Utility Patents 2000 to 2011



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Maintenance by Small Entities

- Small entities 48.3% less likely to pay next maintenance fee
  - controlling for issue year and technology
  - difference decreases (33.1% less likely) for just drug patents

Evidence of Public Value?

Citations

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Patent citations

- Patent *applicants* are required to cite all previous patents relevant to their claimed invention
  - inequitable conduct

- Patent *examiners*, when testing the patent eligibility of an application, also cite relevant patents

- Backward and Forward citations by both

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Citations and public value

- Citations, particularly forward citations, can be a proxy for value
  - Others are building upon/using cited patent
  - Cited patent still technologically/commercially relevant

- Frame this as public value
  - Could also be indicative of private value

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Forward *applicant* citations by entity

APPLICANT CITATIONS	mean	standard deviation	10th%	25th%	median	75th%	90th%	min	max
Large	9.97	45.08	0	0	2	6	19	0	3577
Small	8.70	32.04	0	0	2	6	19	0	3323

- Small entities have 2.11 *less* applicant cites on average
  - controlling for issue year and technology

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Forward *examiner* citations by entity

EXAMINER CITATIONS	mean	standard deviation	10th%	25th%	median	75th%	90th%	min	max
Large	3.47	5.66	0	1	2	4	8	0	469
Small	3.58	5.37	0	1	2	4	9	0	448

- Small entities have 0.24 *more* examiner cites on average
  - controlling for issue year and technology

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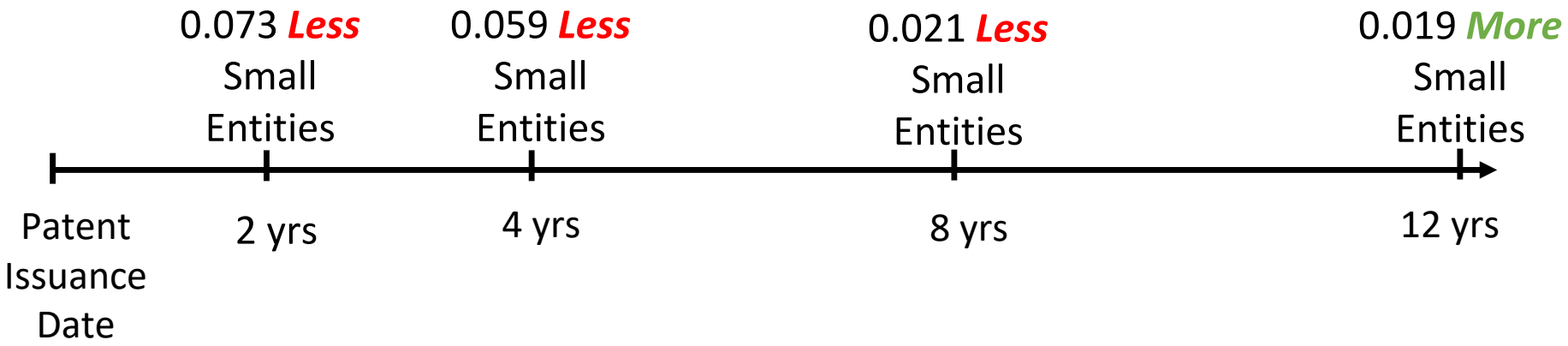
Citation patterns over time

- Few patents have a long forward citation tail
  - Most forward citations are within 2 years of issuance
- Small entity patents exhibit a *long tail* for examiner citations



Implications

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Small entity patents produce unique value

- More “highly cited” patents
  - by examiners
- Longer citation tail (12+ years) after issuance
  - and, again, by examiners
- ~50% cross-pollination with large entity patents

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Small entities don't internalize value

- Small entities less likely to maintain, particularly 12-year
  - ~60% less likely than large entities
  - gap in maintenance even greater for highly cited patents

	12-Year Payment Rate at 75th Examiner Citation Percentile	12-Year Payment Rate at 90th Examiner Citation Percentile
Large	52.67%	58.73%
Small	30.24%	33.09%

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Help small entities internalize value

- *Why?*
  - Maintain/increase incentives to participate
  - Avoid underdeveloped/not fully developed patents
  - Increase speed of development
  - Fairness
- *How?*
  - Lower/delay maintenance fees
  - Spread costs – yearly annuities
  - Patent term extension auctions

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Questions?

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Backup Slides

Recent proposals to rectify

- **Education**
- **Legal assistance**
- **Changes in patenting process**

RICHMOND

Comparative private value

- **On average, small entities are ~50% less likely to make it to the next maintenance stage**
  - **controlling for patent's issue year &**
  - **patent's technology**

- **Fewer small entities maintain their patents**
  - **Previous maintenance payment less indicative of further maintenance for small entities**

USPTO fees

- **Fees to get and keep patent**
  - **application process**
  - **filing fees**
  - **issuance and maintenance fees**

- **Other costs to patenting**
  - **invention costs**
  - **legal costs**

Fee reduction by inventor “size”

- **Fees for 2024**

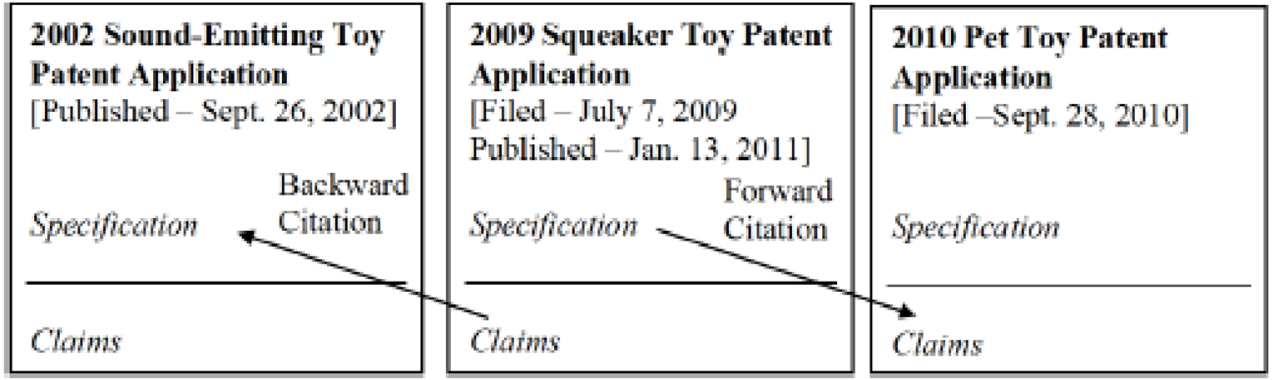
	Filing Fee	Issue Fee	Maintenance Fee		
			4 yr	*8yr*	*12yr*
Large	$1,820	$1,200	$2,000	$3,760	$7,700
Small	$728	$480	$800	$1,504	$3,080
Micro	$364	$240	$400	$752	$1,540

- **Context – legal fees ~8K-15K**

Patent citations

- **For every patent there can be:**
  - ***backward citations* – who the applicant and examiner cited during patent examination**
  - ***forward citations* – citations by applicants and examiners of future patents who cite the earlier issued patent**

Figure 1

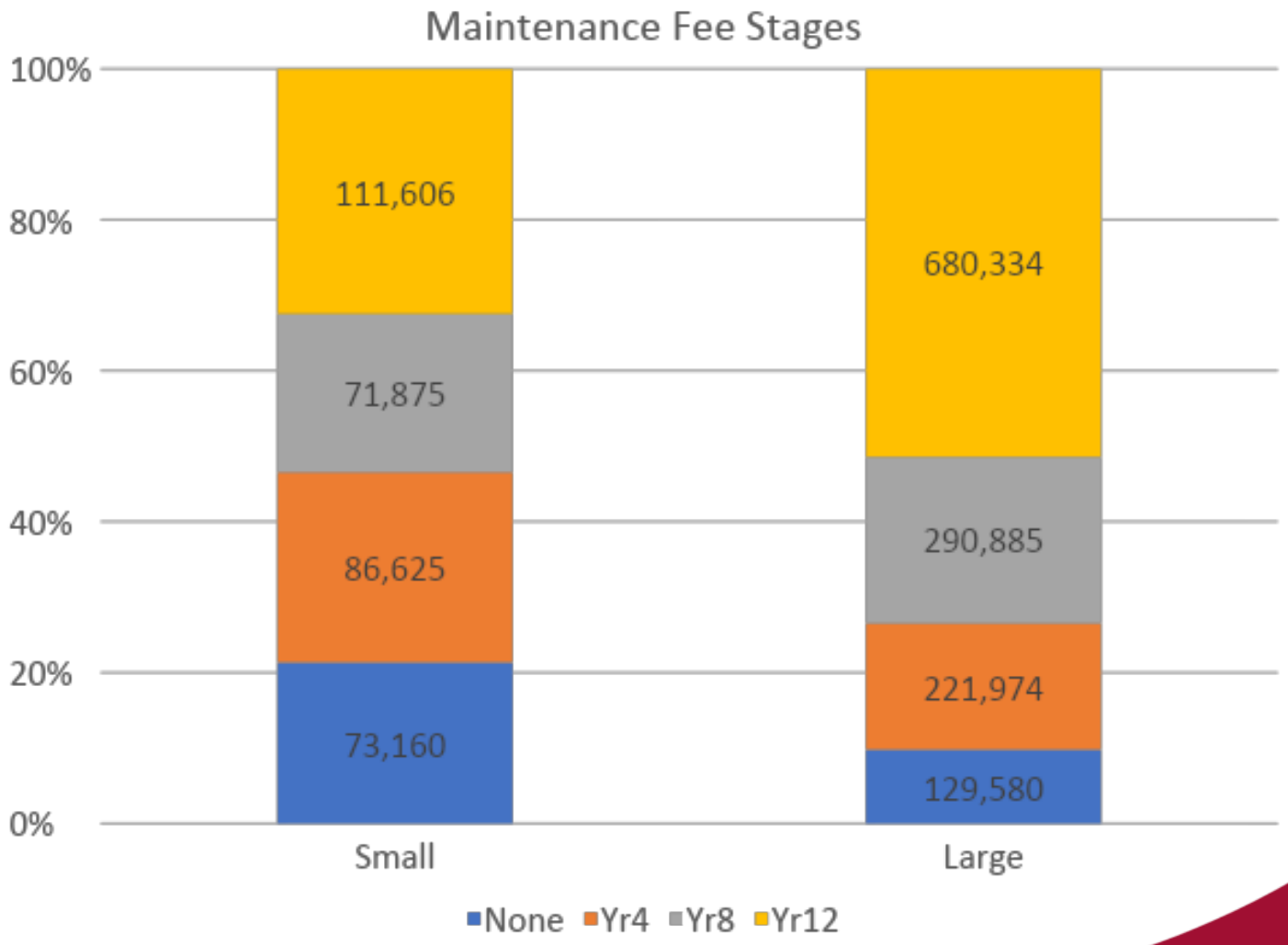


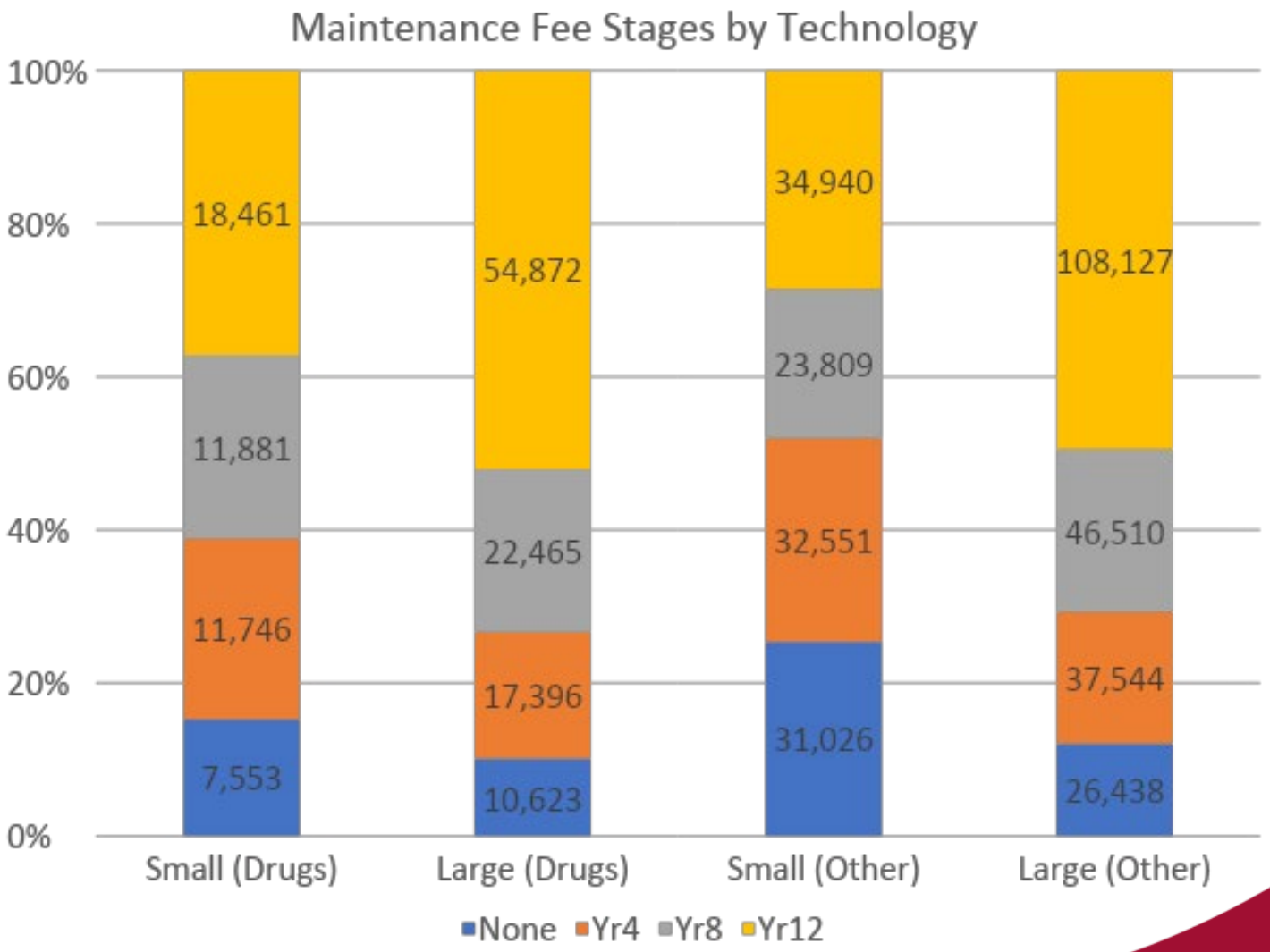
Technologies

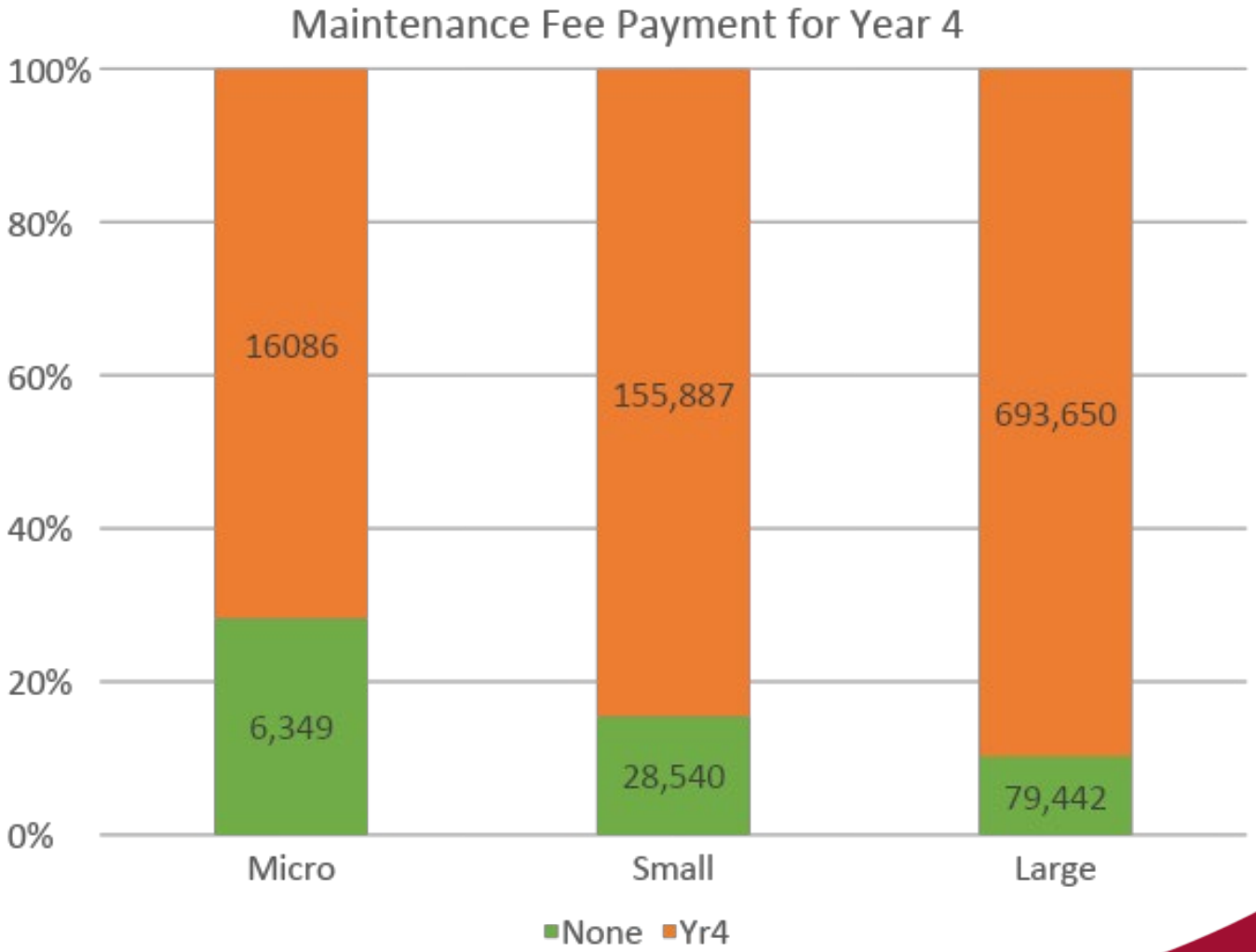
	Chemical	Computers & Comm'n	Drugs & Medical	Electronics	Mechanical	Other
Large	233,436 (80.65%)	825,934 (89.26%)	213,660 (67.39%)	548,547 (86.05%)	291,971 (76.20%)	442,200 (66.78%)
Small	54,079 (18,68%)	95,250 (10.29%)	100,897 (31.82%)	85,580 (13.42%)	84,685 (22.10%)	200,999 (30.36%)
Micro	1,920 (0.66%)	4,132 (0.45%)	2,512 (0.79%)	3,355 (0.53%)	6,490 (1.69%)	18,958 (2.86%)

- **Small entities most prevalent in:**
  - **Drugs/Medical (university driven) &**
  - **"Other" (mainly amusement devices and containers)**

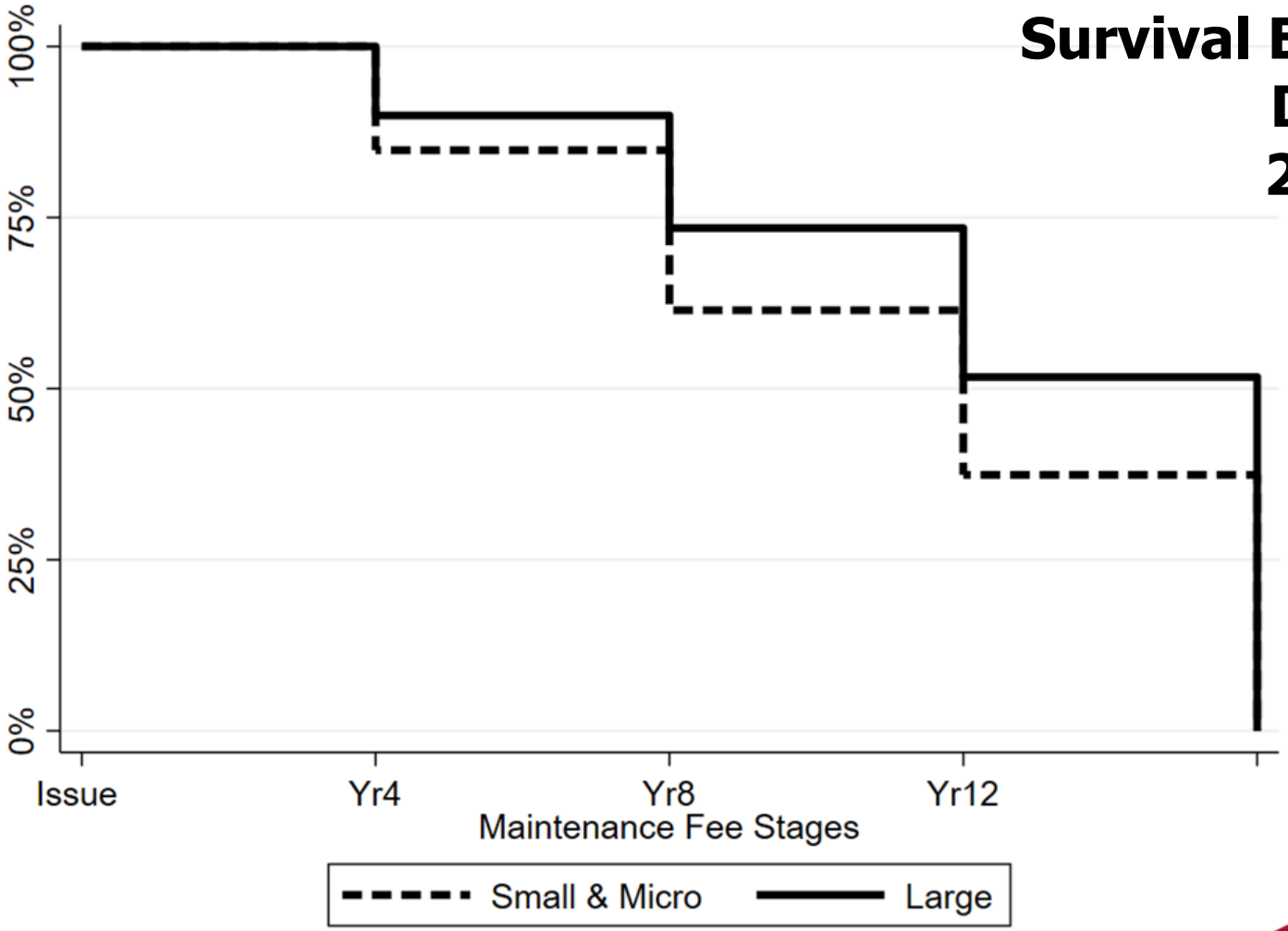
Any Evidence Small Entity Patents Provide Value?


Maintenance Fee Stages
100%
80%
60%
40%
20%
0%
111,606
71,875
86,625
73,160
680,334
290,885
221,974
129,580
Small
Large
None
Yr4
Yr8
Yr12


Maintenance Fee Stages by Technology
100%
80%
60%
40%
20%
0%
18,461
11,881
11,746
7,553
54,872
22,465
17,396
10,623
34,940
23,809
32,551
31,026
108,127
46,510
37,544
26,438
Small (Drugs)
Large (Drugs)
Small (Other)
Large (Other)
None
Yr4
Yr8
Yr12


Maintenance Fee Payment for Year 4
100%
80%
60%
40%
20%
0%
16086
155,887
693,650
6,349
28,540
79,442
Micro
Small
Large
None
Yr4

Survival Estimates for Drug Patents 2000 to 2011



Entities also rarely change

- **Require patentee to change entity if facts warranted**
  - **inequitable conduct**

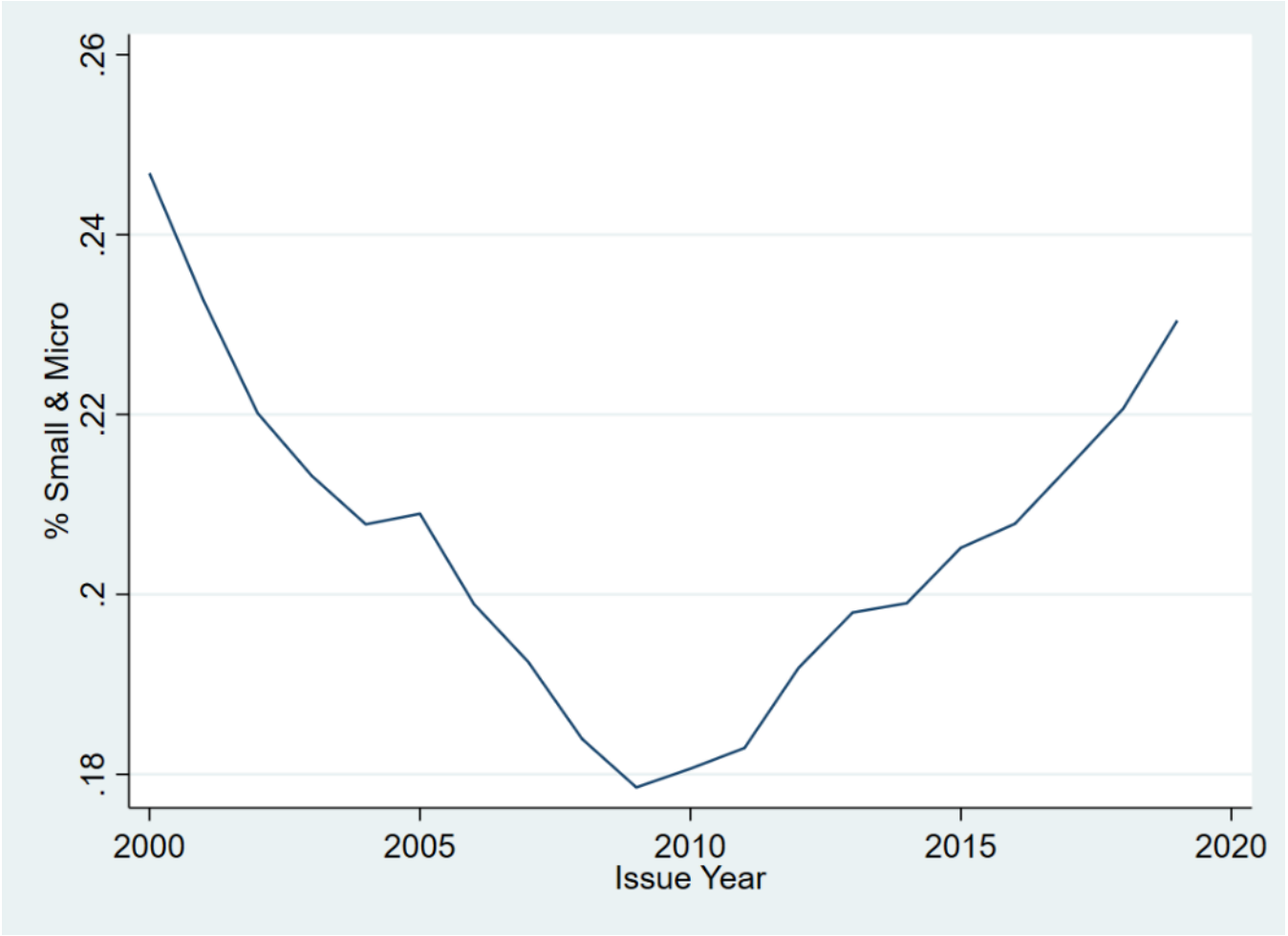
- **Few do:**
  - **8.19% of all small entities that maintain change to large (80,325)**
  - **5.74% of all micro entities that maintain change to small (3,039)**

- **Difficult to contextualize these results**
- **And selection effect**

All forward citations by entity

ALL CITATIONS	mean	standard deviation	10th%	25th%	median	75th%	90th%	min	max
Large	16.28	52.68	1	2	5	13	34	1	3698
Small	14.60	39.11	1	2	5	13	32	1	3443

- **Small entities have 2.55 *less* total cites on average**
  - **controlling for issue year and technology**

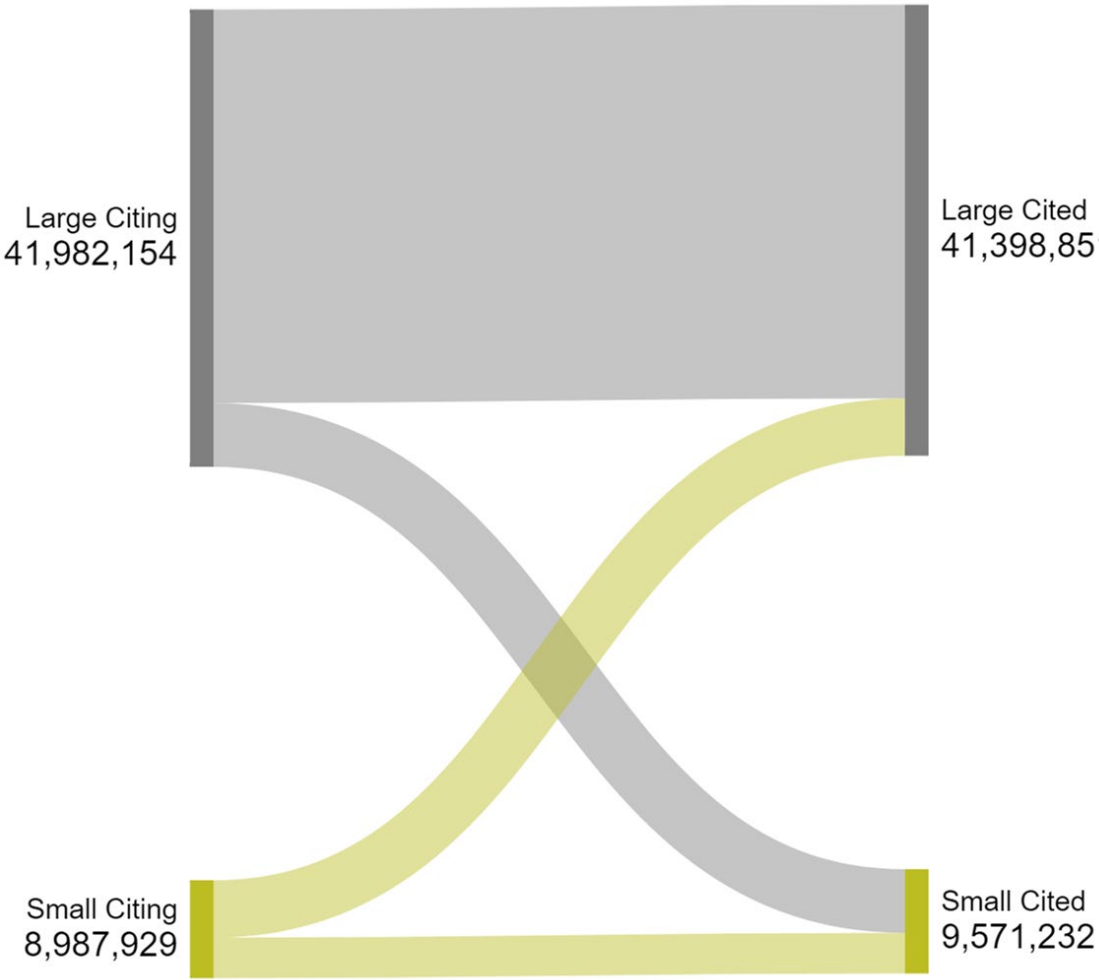

% Small & Micro
.18
.2
.22
.24
.26
2000
2005
2010
2015
2020
Issue Year

Who is citing who?

- **Observe citation interactions by entity types**
  - **Citation pairs – citing patent -> cited patent**

	Large Cited Patent	Small Cited Patent
Large Citing Patent	36,136,069 (86.07%)	5,846,085 (13.93%)
Small Citing Patent	5,262,782 (58.55 %)	3,725,147 (41.45%)

- **On average, 4.06 times *more* likely to cite the same**
  - **controlling cited issue year and technology**
  - **driven by high number of large entity patents**



- **Small entities cite more large than small**
- **Higher % of cross-pollination with small entities**

What is a patent?

- **Government grant of limited exclusivity**

What is a “small entity”?

- **In patent context, a small business or individual inventor**