

The Value of Patents for VC-Backed Firms:

Preliminary evidence from Semiconductors, Software, and Medical Devices

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based on joint research with David Hsu, Wharton

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Sample & Data

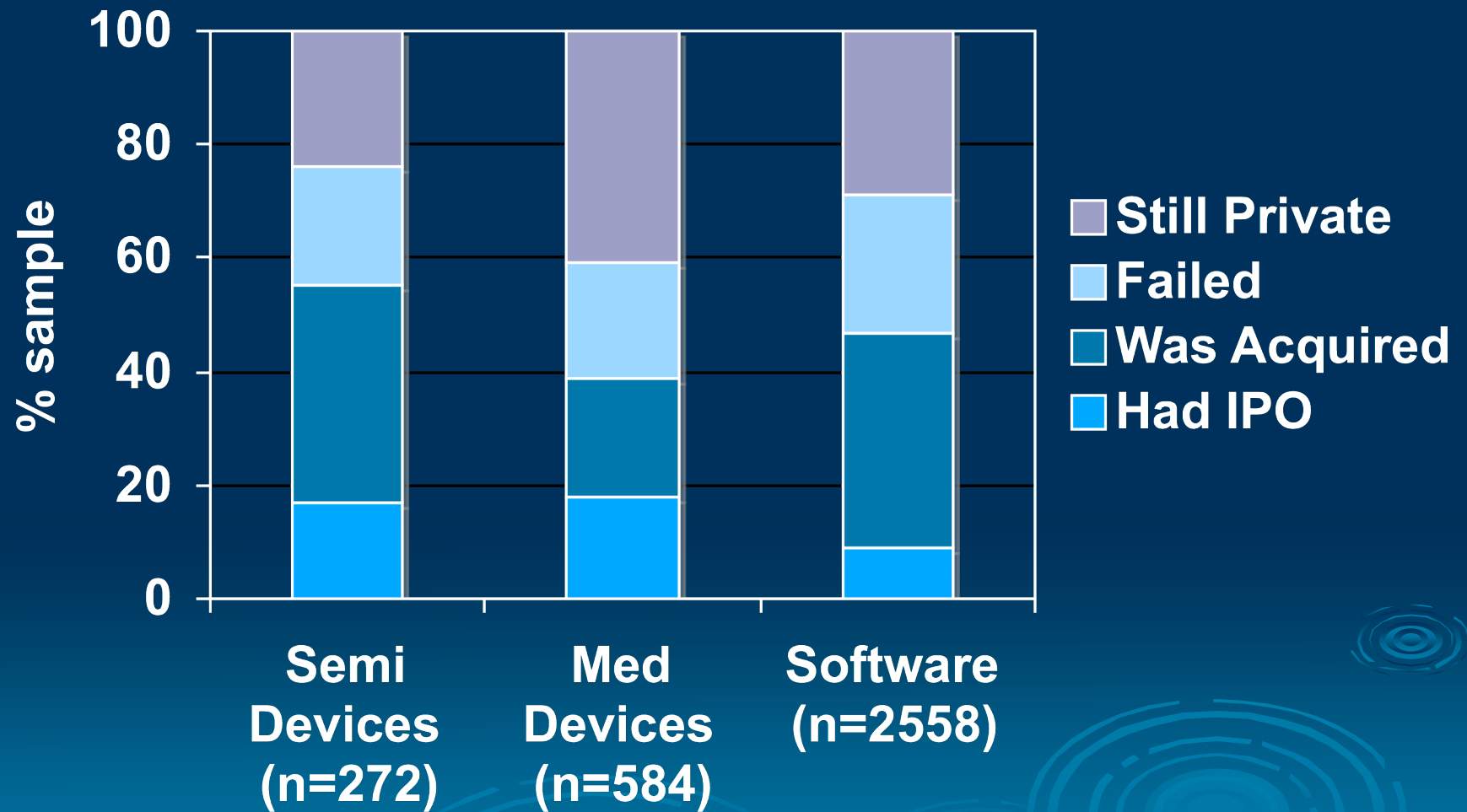
VC-backed U.S. startups founded 1987-99

- semiconductor devices (Information Technology)
- medical devices (Life Sciences)
- software (Information Technology)

Primary sources:

- DowJones VentureSource database
 - Delphion.com
 - Lexis/Nexis, Factiva
- 
- A decorative graphic consisting of several concentric circles of varying sizes and shades of blue, located in the bottom right corner of the slide.

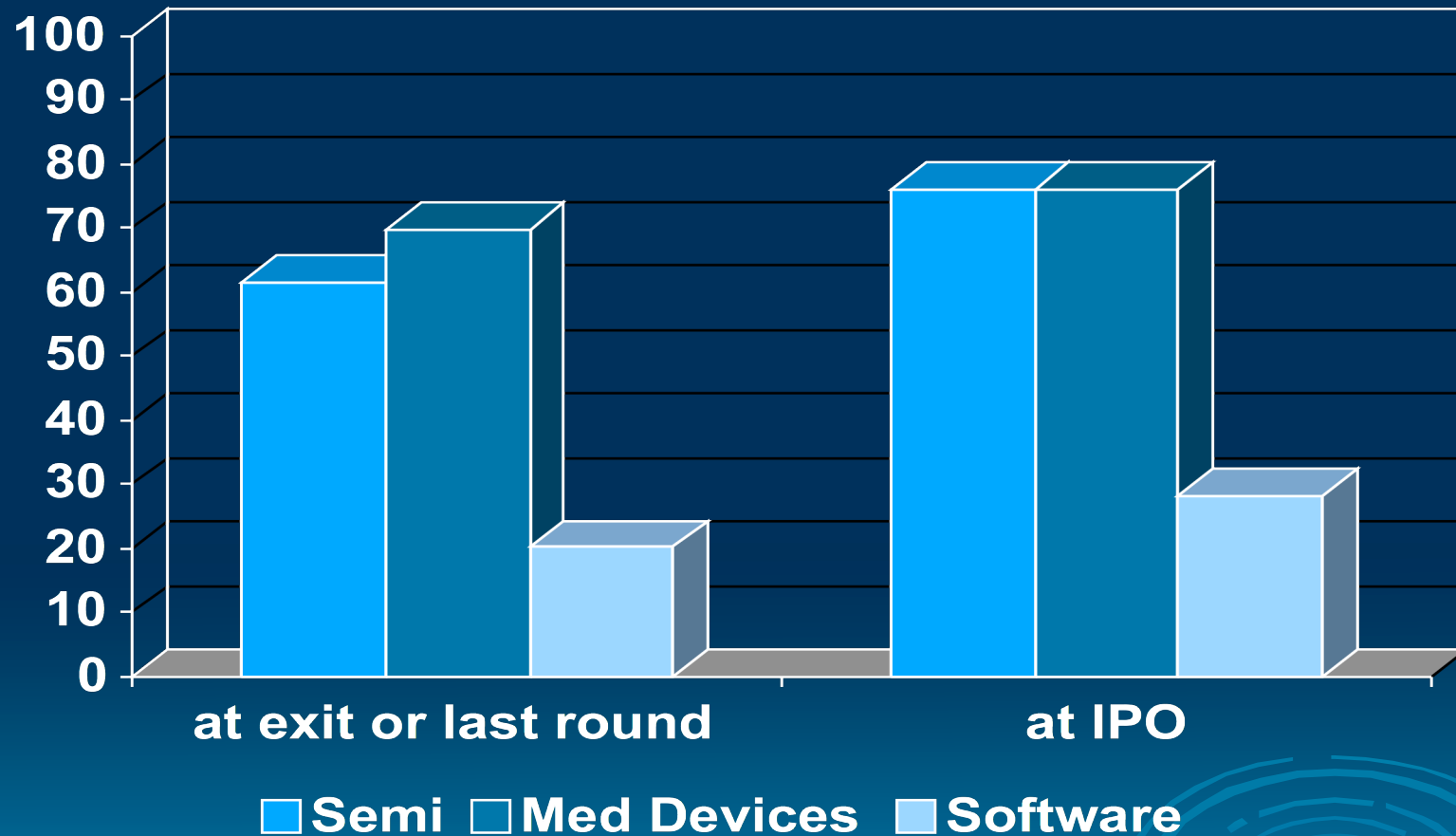
Exit Status by 2006



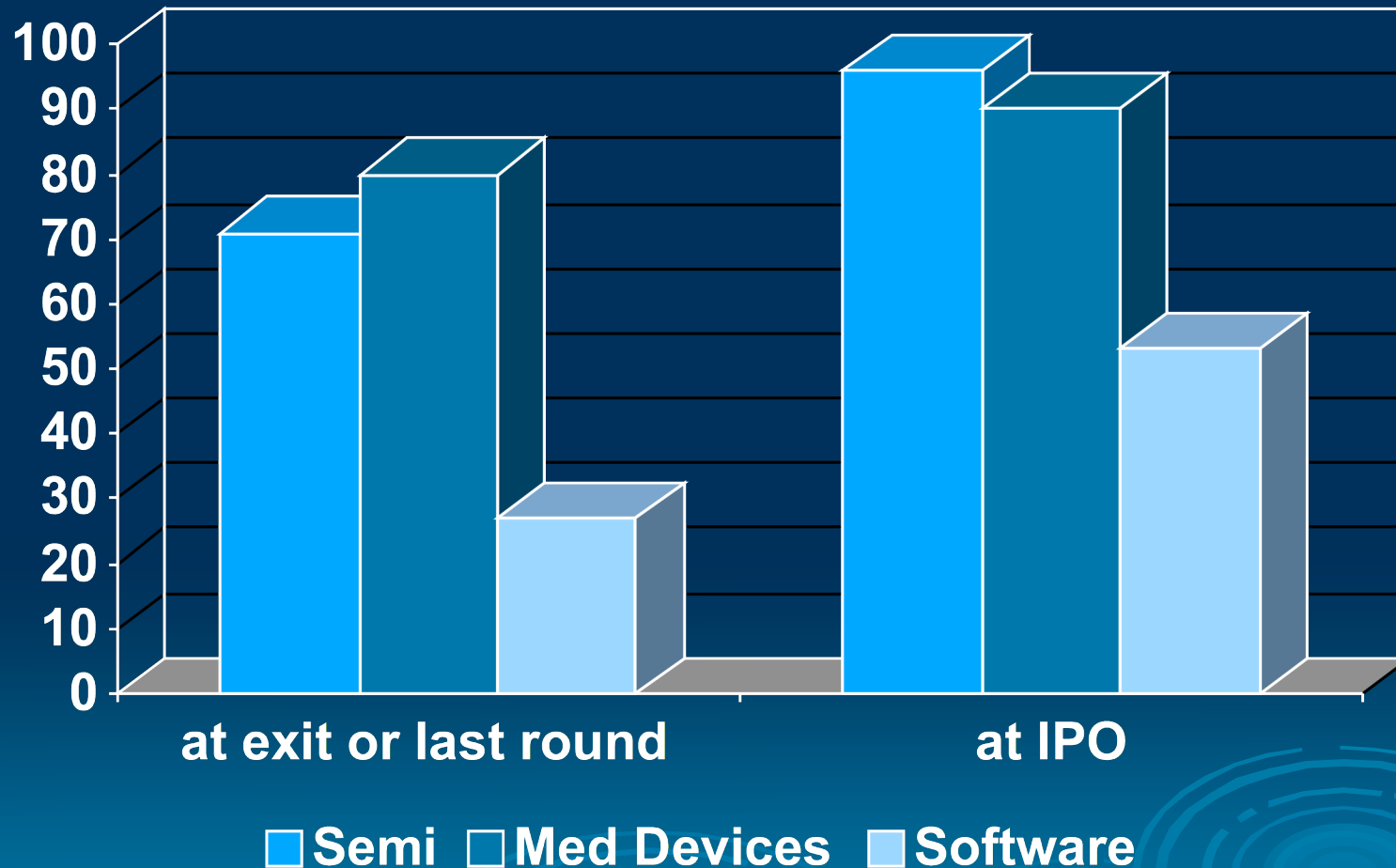
What % of these firms patent?



% with U.S. patents granted



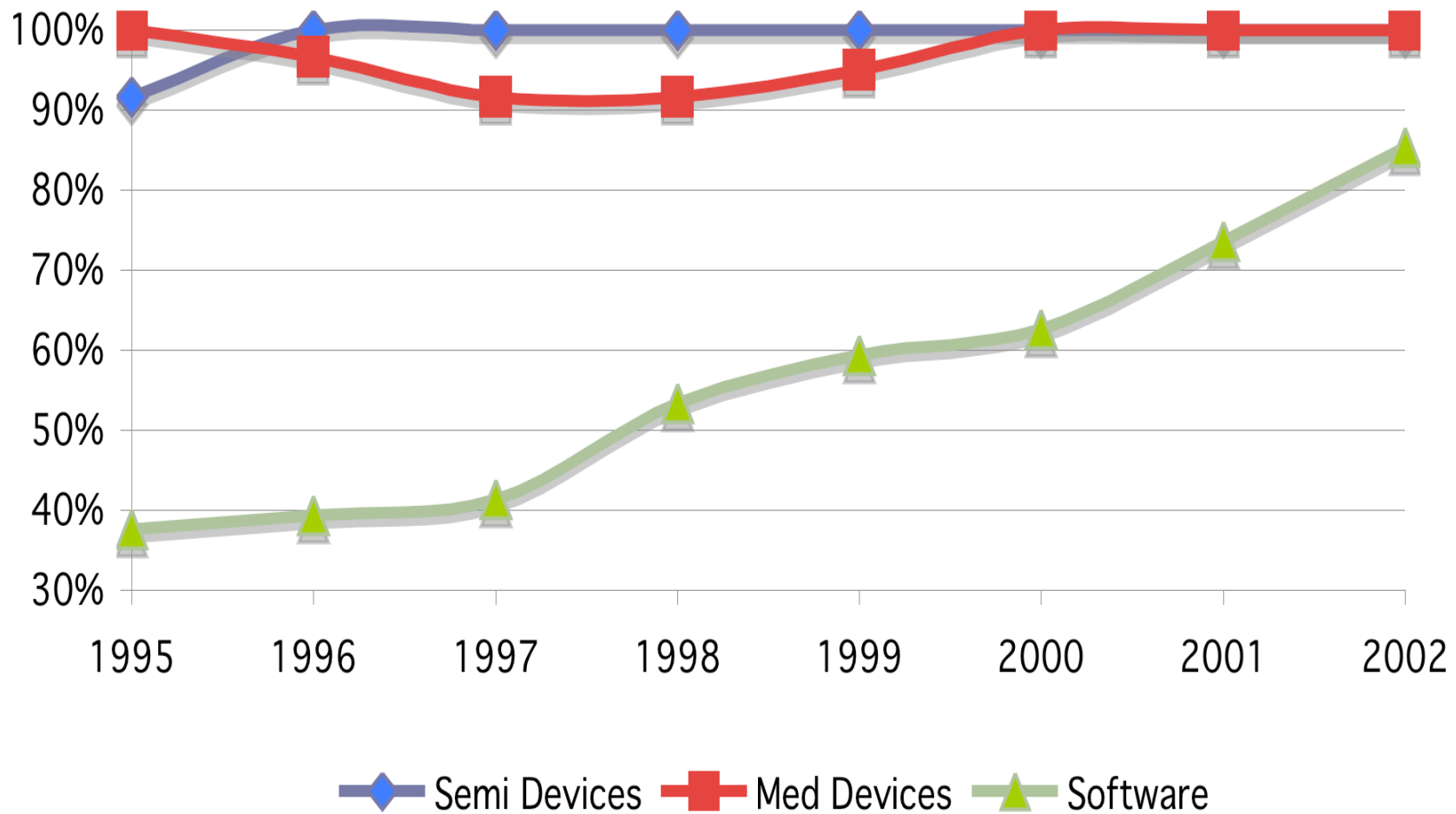
% with U.S. patents granted or pending



Note: % is based on firms with at least 1 application pending that results in an issued U.S. patent; foreign filings and U.S. applications that are abandoned or rejected are not included.

% with U.S. patents pending at IPO

(IPO subset only; 3-yr moving average)

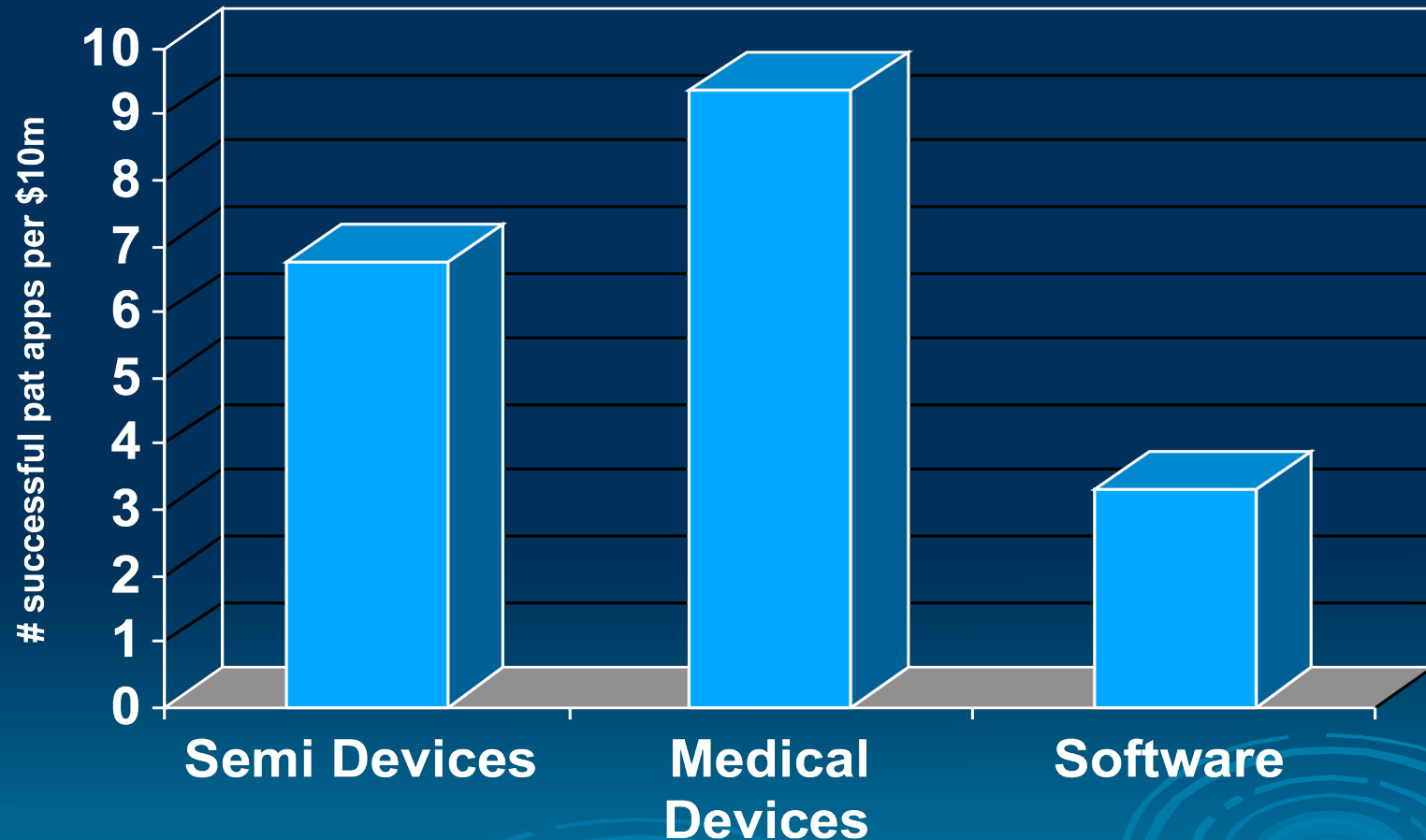


How intensively do startups in these sectors seek patent protection?

Rough proxy: What share of financial resources do they devote to the task?



Ave # successful U.S. applications filed per \$10 million raised in pre-exit funding rounds



Note: Cumulative amount raised is measured in constant 2000-year dollars.

A Closer Look “within IT”



Estimates #1:

Patent “Propensity”

Is there a significant difference between software and semiconductors in the propensities to file patents?

Are there important changes over time?

A series of concentric circles in a lighter blue shade are positioned at the bottom of the slide, centered horizontally and partially overlapping the text area.

Regression Estimates of Propensities to Patent

(Poisson; Y= # successful patent filings by last round or exit)

	Semi + SW
Software Startup?	
Log Total Equity	0.48***
Startup age	0.09***
Exit via IPO	0.88***
Exit via Acquisition	-0.08
1992-1996 period	1.04*
1997-2001 period	1.34**
2002-2006 period	1.25*
# Observations	2776

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(Poisson; Y= # successful patent filings by last round or exit)

	Semi + SW	Semi Only	Software Only
Software Startup?	-1.85***	--	--
Log Total Equity	0.48***	0.40***	0.53***
Startup age	0.09***	0.10***	0.09***
Exit via IPO	0.88***	0.69***	1.12***
Exit via Acquisition	-0.08	-0.20	0.01
1992-1996 period	1.04*	1.12	1.37
1997-2001 period	1.34**	1.20	1.90**
2002-2006 period	1.25*	1.30	1.70**
# Observations	2776	270	2506

Regression Estimates of Propensities to Patent

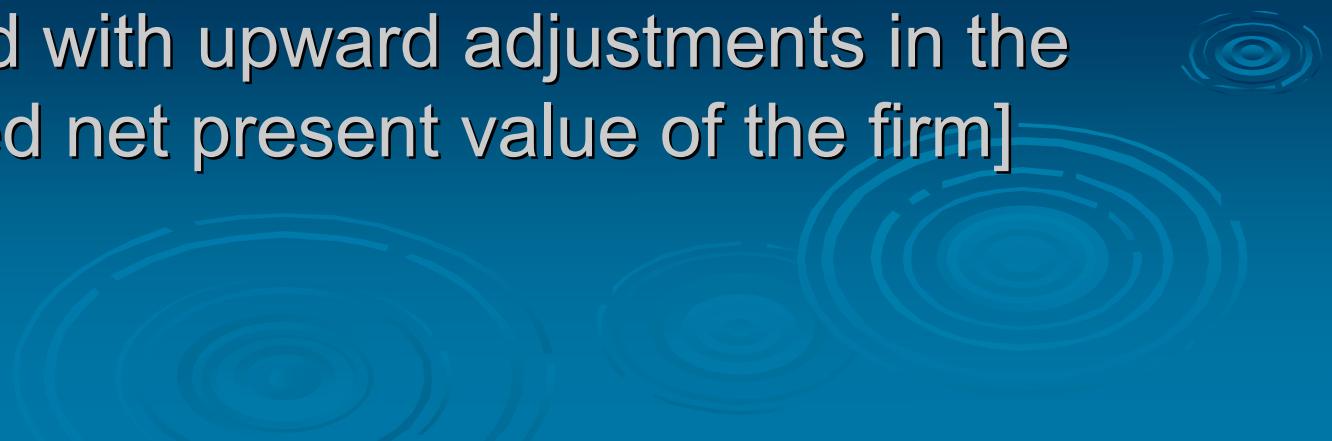
(Poisson; Y= # successful patent filings by last round or exit)

	Semi + SW	Semi Only	Software Only
Software Startup?	-1.85***	--	--
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Estimates #2:

Patent “Value”

[goal = to estimate the magnitude with which, if at all, changes in a startup's patent filings are associated with upward adjustments in the estimated net present value of the firm]

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Marginal Effect of Patenting on Startup Valuation

(OLS; Y= Log Pre-Money Valuation with Startup Fixed Effect)

	Semi
Log patents pending	0.39**
Early financing round	-0.78*
Log corporate investors	0.45***
Shift to profitability?	0.56***
Angel round?	-0.50*
Acquisition round?	0.47
IPO round?	0.72***
Startup age	0.01
Pre-1997 round?	-0.06
1998-2000 round?	0.43***
# Observations	626

Caution: Estimated patent effect is likely to be biased upward in these regressions; refinements in-progress.

Marginal Effect of Patenting on Startup Valuation

(OLS; Y= Log Pre-Money Valuation with Startup Fixed Effect)

	Semi	SW 1987-91 cohort	SW 1992-96 cohort
Log patents pending	0.39**	0.19***	0.33***
Early financing round	-0.78*	-0.50***	-0.77***
Log corporate investors	0.45***	0.29*	0.63***
Shift to profitability?	0.56***	0.20**	0.15
Angel round?	-0.50*	0.15	-0.13
Acquisition round?	0.47	-0.15	0.17**
IPO round?	0.72***	1.11***	1.34***
Startup age	0.01	0.11***	0.09***
Pre-1997 round?	-0.06	0.69**	0.85***
1998-2000 round?	0.43***	0.76***	1.10***
# Observations	626	1006	3236

Caution: Estimated patent effect is likely to be biased upward in these regressions; refinements-in-progress.

Summary

- Considerable entrepreneurial-firm resources are devoted toward the filing of patents, especially in the two device sectors
- Within IT, an apparent “regime change” within software?
 - steady climb in % startups filing patents pre-IPO
 - significant increase in residual growth rate of patenting
 - younger cohorts appear to capture greater value from owning patents than do older cohorts of software startups
- Patents clearly “matter” to many startups in all three sectors. But why? How do patent filings or awards affect the financing and innovation activities of new ventures?