

The Market for Software Innovation Through the Lens of Patent Licenses and Sales

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“Software is
eating the world.”

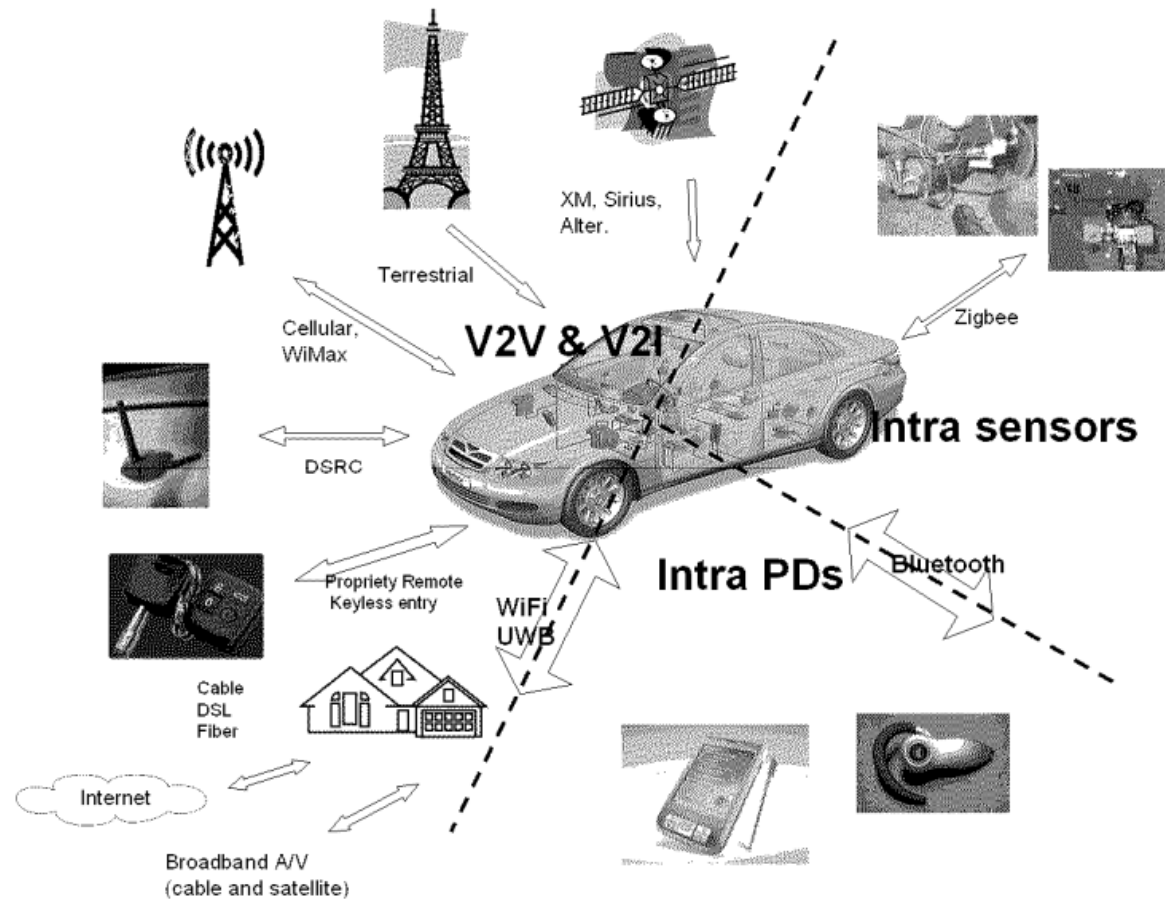
Marc Andreessen



Software Eats the World: Transportation



Software Eats the World: Transportation



Software Eats the World: Retail

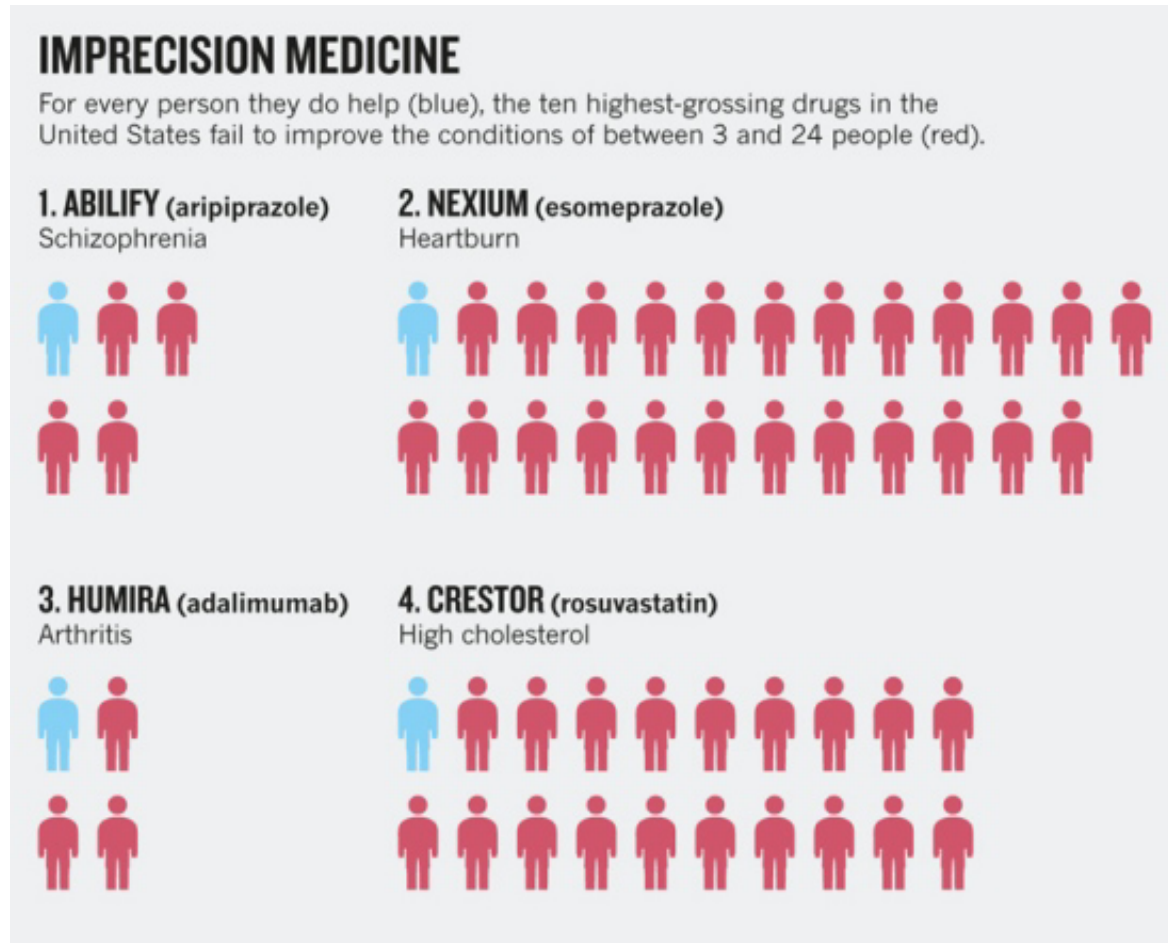
amazon.com

The Amazon logo, featuring a curved orange arrow pointing from the letter 'a' to the letter 'z'.

Walmart


The Walmart logo, featuring a yellow six-pointed starburst icon.

Software Eats the World: Medicine



Blue = drug helped
Red = drug didn't help

Software Eats the World: Medicine

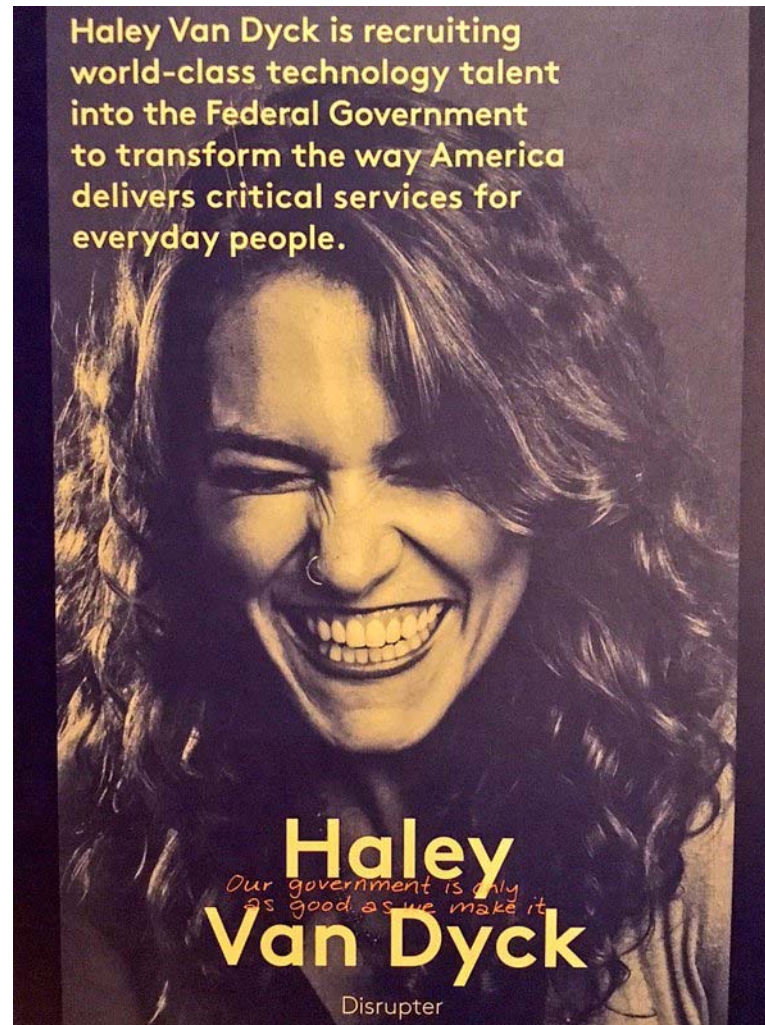


PRESIDENT OBAMA'S PRECISION MEDICINE INITIATIVE WOULD
**HELP DEVELOP BETTER TREATMENTS
FOR DISEASES LIKE CANCER BY:**

- Accelerating the design and testing of effective **treatments tailored to individual patients**
- Expanding genetically based clinical cancer trials
- Establishing a national "**cancer knowledge network**" to guide treatment decisions

talent

SW Eats the World: Government Services



Watch Haley's TED talk at [Ted.com](https://www.ted.com)

Software Eats the World

“We find strong statistical evidence for the growing importance of software-related technologies for successful innovation ..in auto and auto parts, aerospace and defense, medical devices, and pharmaceuticals”

Get With the Program: Software-Driven Innovation in Traditional Manufacturing

Lee G. Branstetter, Matej Drev, and Namho Kwon

NBER Working Paper No. 21752

Software Eats the World

MORE SOFTWARE MEANS (A LOT) **MORE CODE**

To put this into perspective, consider the lines of code required for the following:

The adoption of software by every industry has created an explosion in lines of software code written.



PACEMAKER

80,000 lines of code

F-22 RAPTOR

1.7 million lines of code



BOEING 787 DREAMLINER

6.5 million lines of code
(just for avionics & onboard support systems)

CHEVY VOLT

10 million lines of code



**If software is eating the
world, does intellectual
property matter?**

If software is eating the world, does intellectual property matter?

YES

- 1. Permissionless innovation**
- 2. Problems of software patents and IP are everyone's problems, not just "tech" problems.**
- 3. The internet should [but doesn't yet] have a built-in framework for micropayments. (Tim Berners Lee)**

If software is eating the world, does intellectual property matter?

NO

1. Value proposition so compelling, we'll get there no matter where defaults are set
2. Monopoly is being secured, not by IP, but by network effects, proprietary technology (often, built on data), economies of scale, and “winner take all” business models. See:

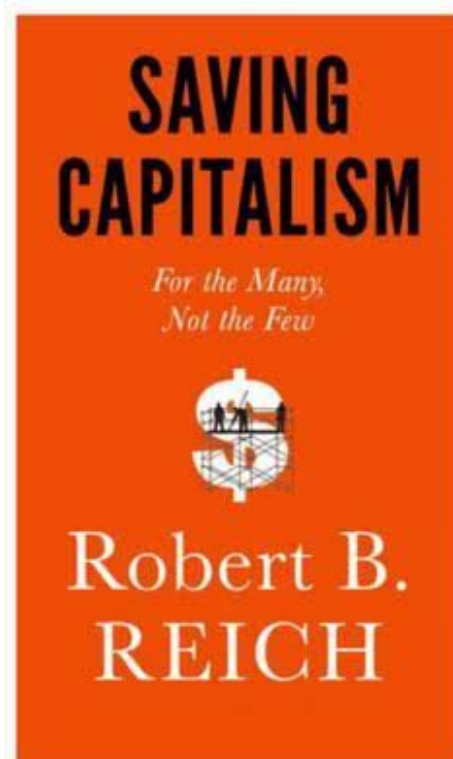
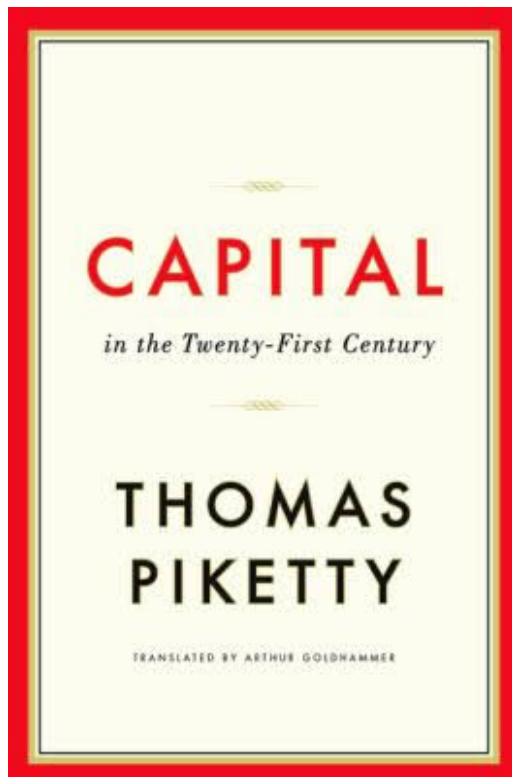


DECEMBER 30, 2015

IN SILICON VALLEY NOW, IT'S ALMOST ALWAYS
WINNER TAKES ALL

BY OM MALIK

techdirt



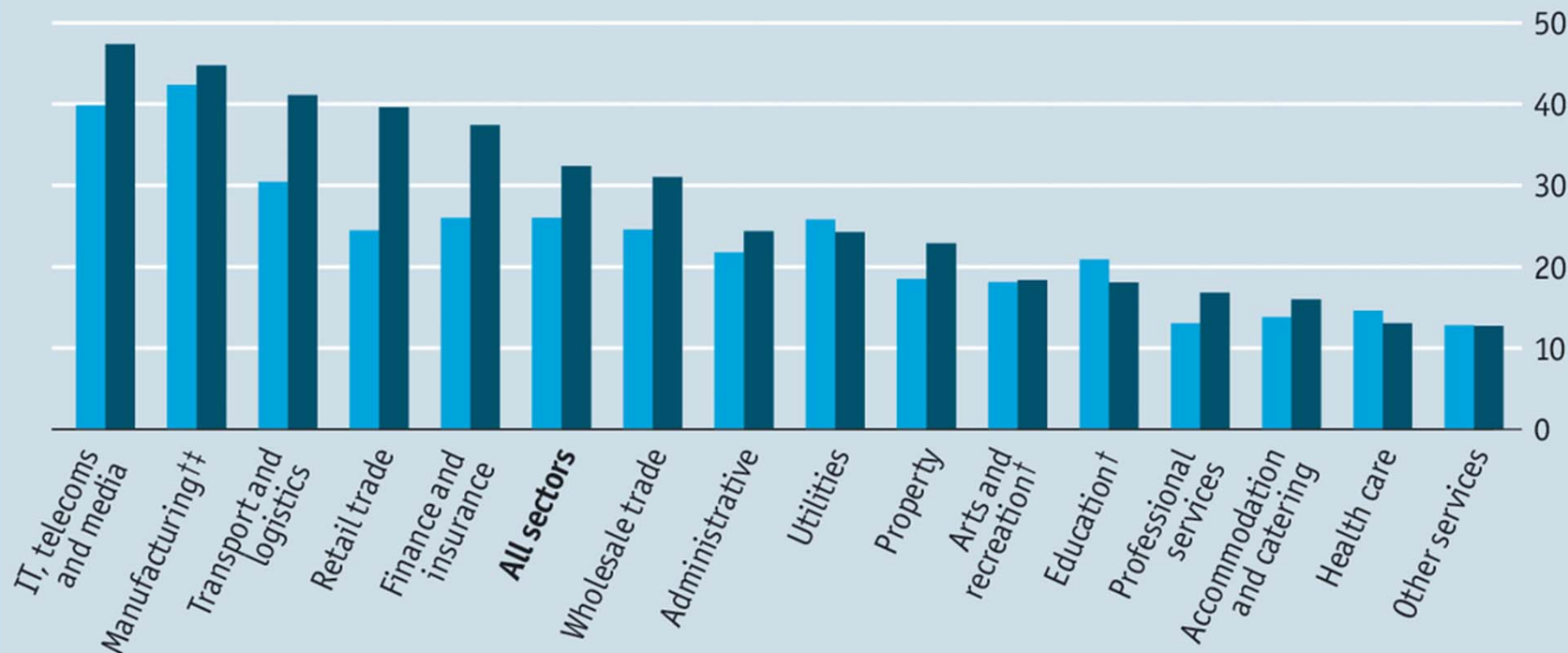
The top 4 firms in IT, telecoms, media, manufacturing, transport, logistics, and retail make 40% of the revenue

More to fewer

Top four firms' average share of total revenue, %
United States, across 893 industries, grouped by sector*

1997

2012



Sources: US Census Bureau; *The Economist*

*Weighted-average †2007 ‡By valued-added

Software Eats the World: Transportation



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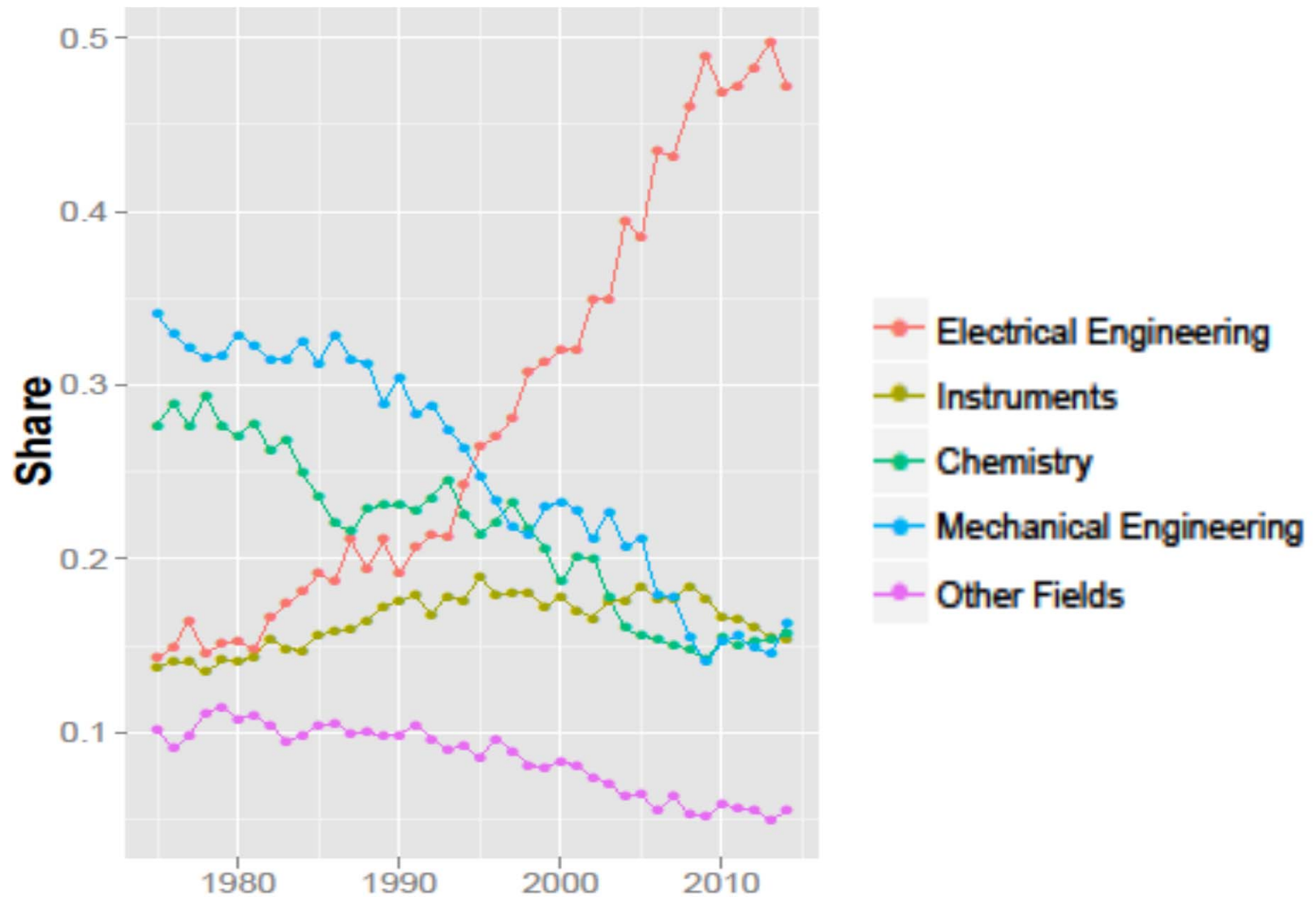


Colleen Chien @colleen_chien · 11 May 2012

New patent fact #1 I'll be presenting @ Princeton today: Google and Apple spent more on patents last year than on R&D.

The Rise of Silicon and Decline of Carbon and Steel

Shares of US Patents by Industry 1970-2015



Source: Opening the Patent System, Colleen V. Chien, Southern Cal. L. Rev. 2016

The Market for Innovation Also Matters

“[Based on surveying 6,000 manufacturing firms] **49%** [of innovating firms] report that their most important new product had originated from an outside source, notably customers, suppliers and technology specialists (i.e., universities, independent inventors and R&D contractors).”

The Acquisition and Commercialization of Invention
in American Manufacturing: Incidence and Impact
Ashish Arora, Wesley M. Cohen, John P. Walsh
NBER Working Paper No. 20264

This paper: how do the sales and licensing of patents support software innovation?

PRELIMINARY
FINDINGS

Databases

- Material licenses reported by public companies to the SEC collected by ktMine
- Recorded assignments reflective of stand-alone patent sales (“sales”) collected by Innography PMT*
- COMPUSTAT, ReferenceUSA, Bloomberg



Scope of analysis/Definitions

- Material technology licenses effective 2000-2015
- Sales of US “software” patents registered at the PTO 2012-2015
- “Software” by Graham & Mowery 2003, Bessen & Mauer 2007, Graham et al 2009

Read & interpret data with caution given selection, limits of analysis.

**(patent sales analysis from forthcoming study by Esmaeil Khaskari & Colleen Chien)*

This paper: how do the sales and licensing of patents support software innovation?

Questions probed

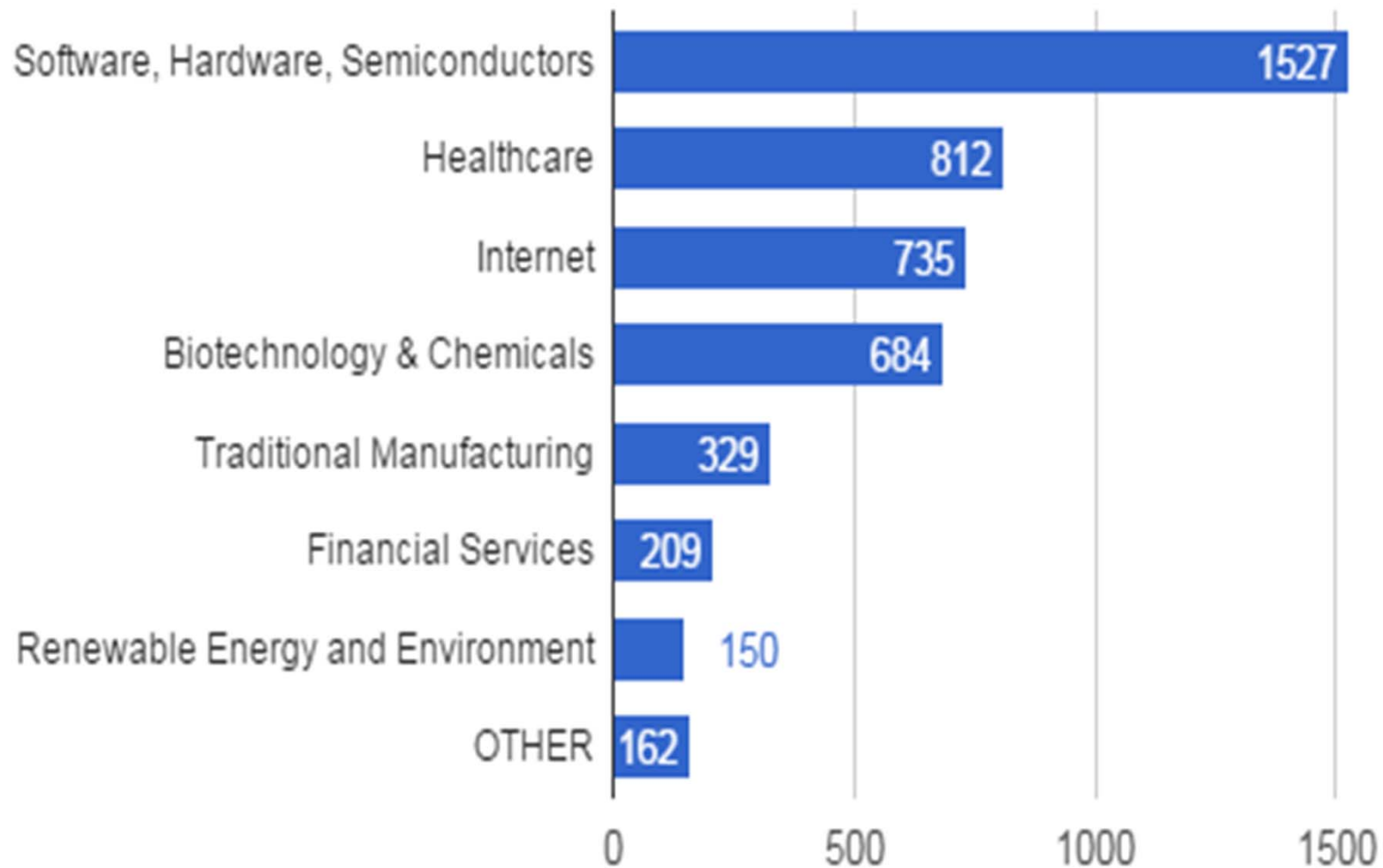
- 1. How often and broadly is software part of technology agreements?**
- 2. What role are patents playing in the market for software innovation based on looking at material technology agreements filed at the SEC?**
- 3. How do patent sales support software innovation with respect to the redistribution of rights and capital?**

1. Software (licenses) eat the world

- Software is part of an estimated 42% of material technology agreements registered at the SEC since 2000 (2,645 out of 6019), and is core to about 24% of these agreements (1,451 out of 2,645).
- But these agreements are only being filed by a small percentage of companies per year.

2. Material technology agreements involving software span tech and non-tech industries

Material Software Technology Agreements* by Industry (2000-2015) (N=2,564)

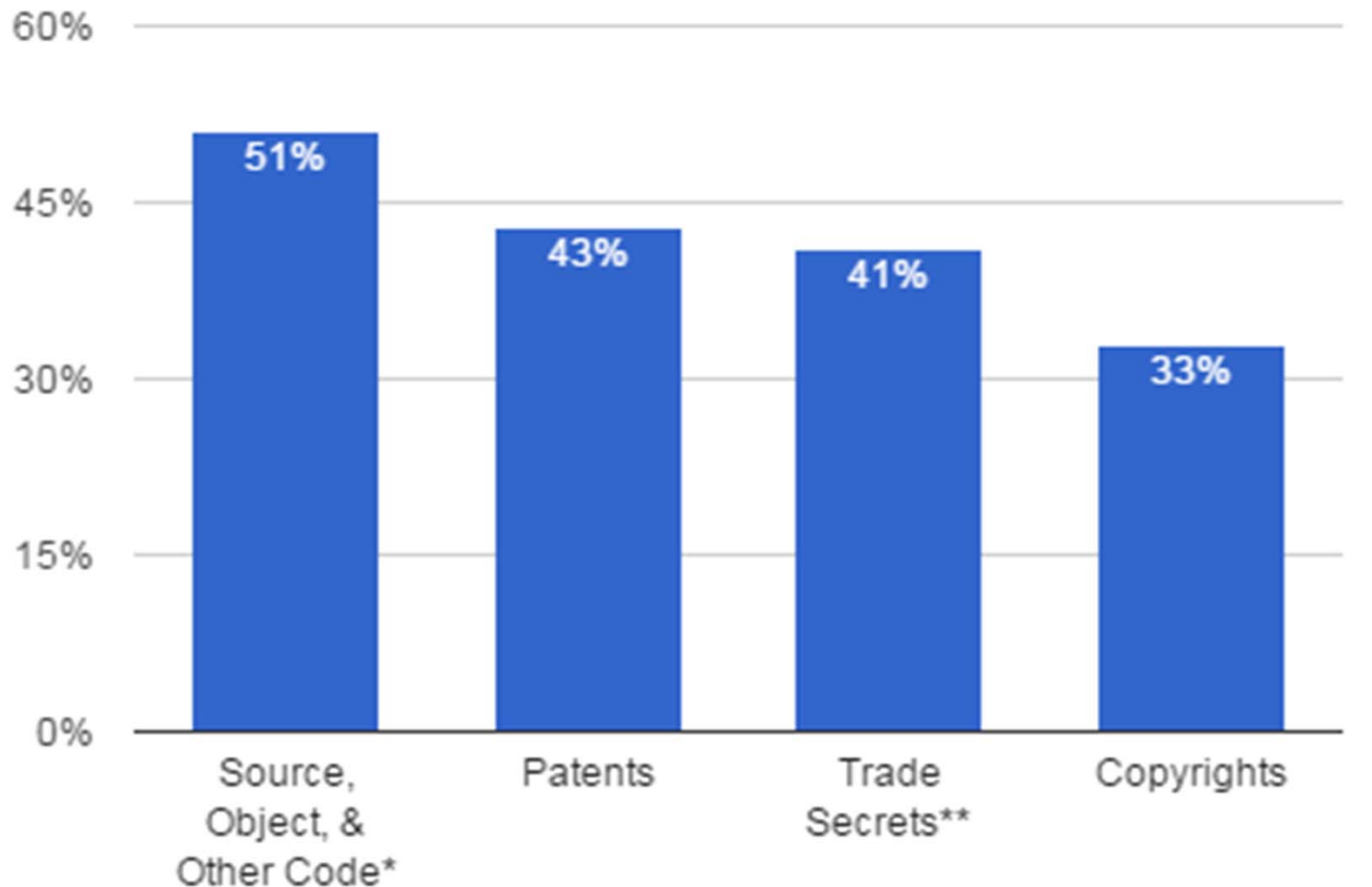


*Technology agreements that include software clauses

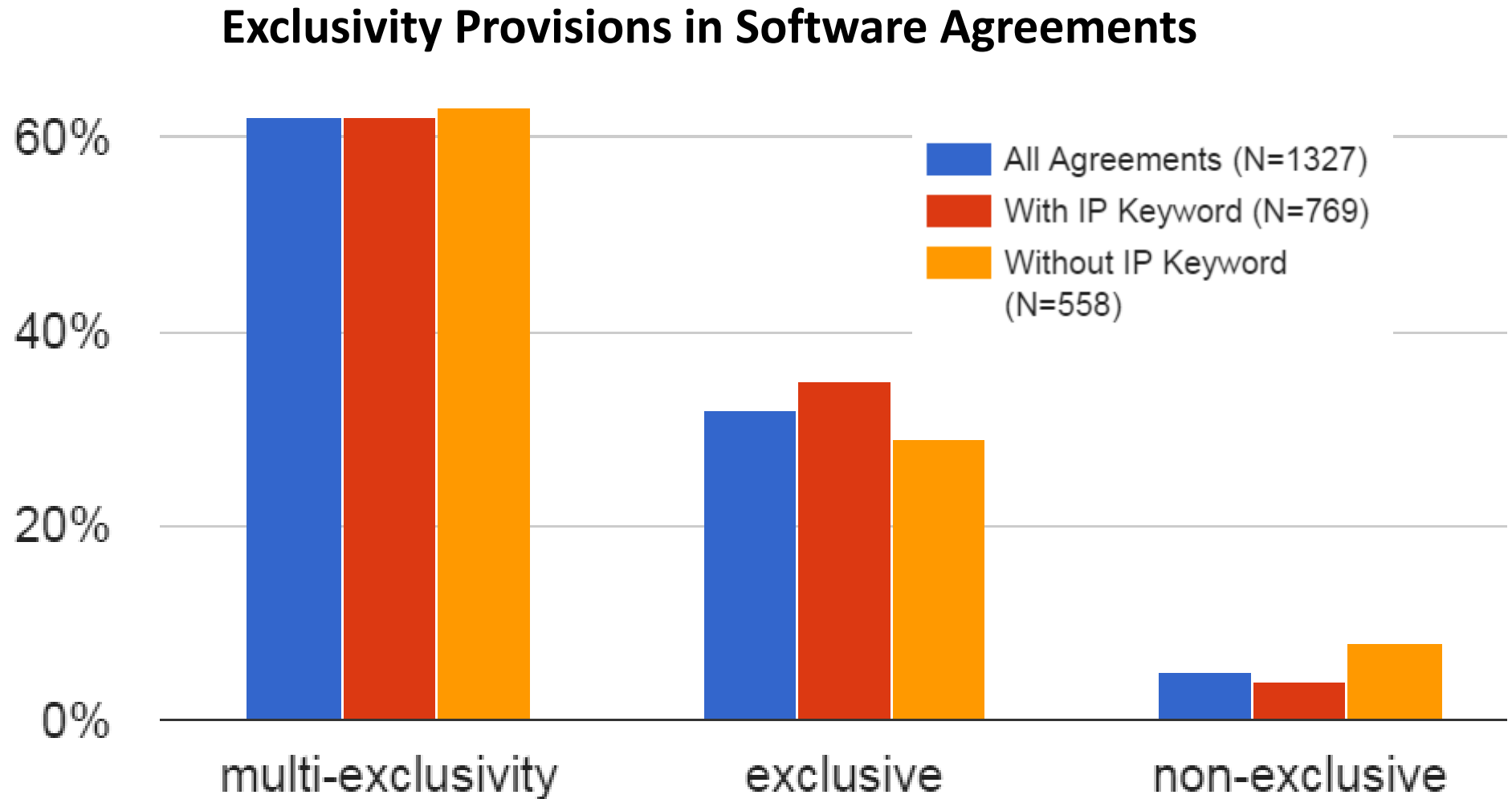
3. Based on material, filed agreements, patents support play a mixed role in agreements about licensing of software innovation, transferring legal liability in a majority of cases (through, e.g. indemnity and settlement clauses), but also transferring technology in a substantial minority of them.

But technology transfer is supported by much more than patents

Key Components of Material Software Agreements (N=1,451)

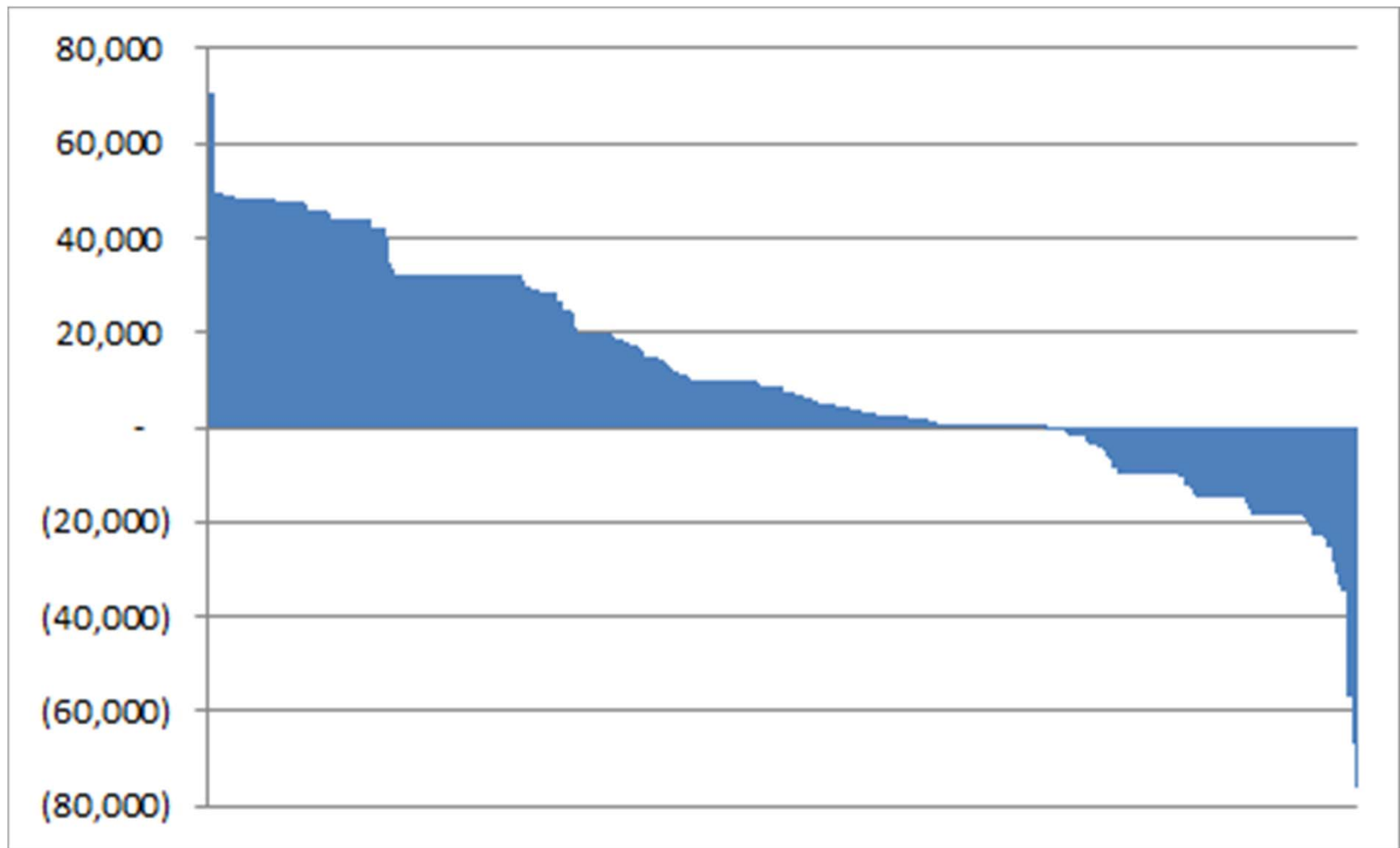


And exclusivity provisions do not seem to depend on Intellectual property

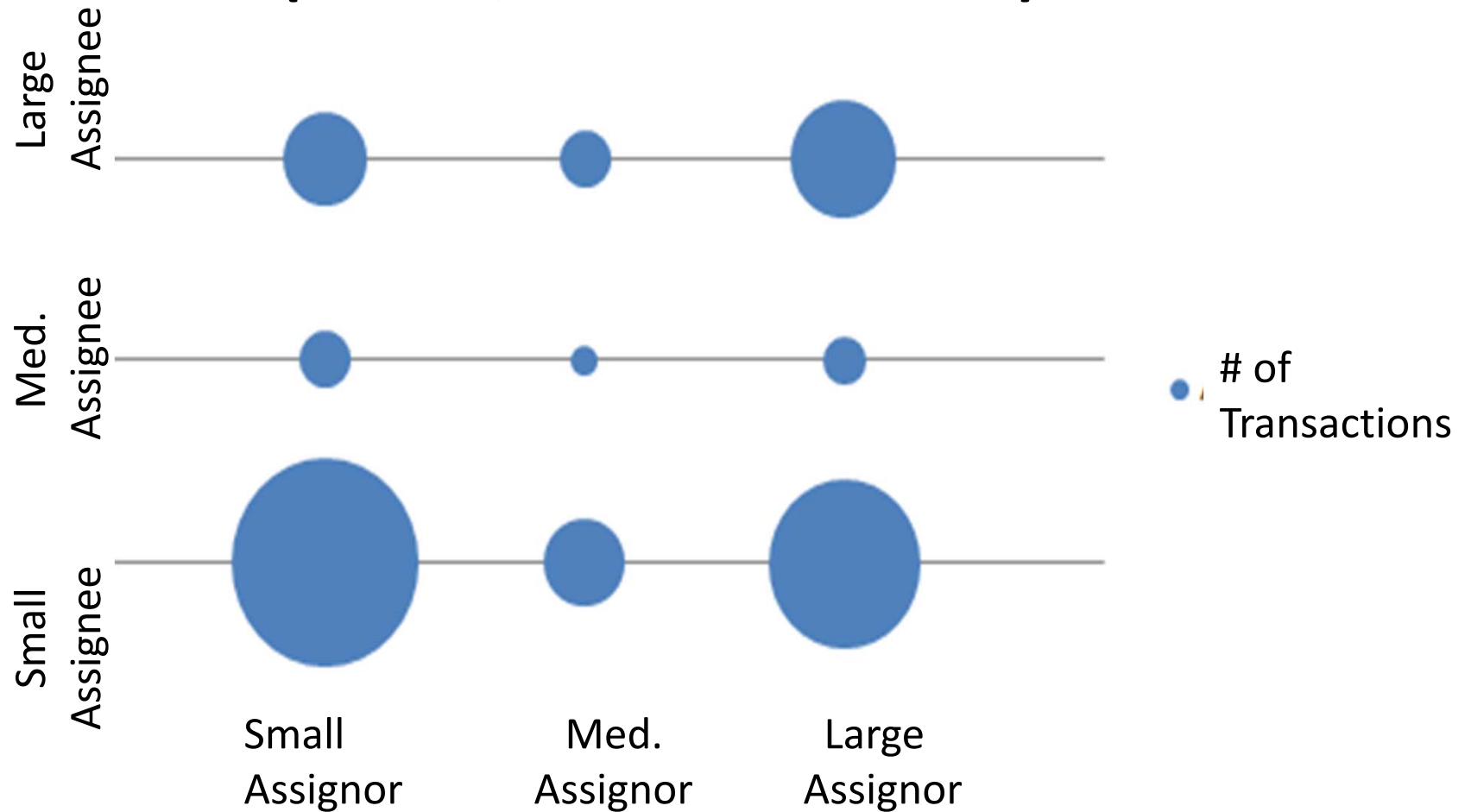


4. About 2% of active software patents were transferred per year from 2012-2015, 73% of the time from a larger to a smaller patentholder, resulting in a redistribution upward of capital but redistribution downward of patents.

Differences between Patent Assignor and Patent Assignee Patent Portfolios (N=31,134 patents)



The Redistribution of Software Patents (N = 14,788 transactions)



Size based on patentholding. Small = <15 patents; medium = 15-100 patents; large = 101+ patents.

5. Patent sales are supporting transfers of technology and legal liability

- Suspected patent + transfer

| Top Patent Sales 2013-2015 | Patents |
|--|---------|
| IBM to Globalfoundries Inc.* | 2240 |
| HP Inc. to TCL Corporation | 1123 |
| Lenovo Group to Alphabet Inc. | 834 |
| Fujitsu and Panasonic to Socionext | 820 |
| IBM to Lenovo Group* | 783 |
| HP to Qualcomm | 599 |
| IBM to LinkedIn | 516 |
| IBM to Twitter | 495 |
| IBM to Facebook | 414 |
| Eastman Kodak to Intellectual Ventures | 310 |

In sum

PRELIMINARY
FINDINGS

How often and broadly is software part of technology agreements?

42% of material agreements include software, 25% of material agreements are about software

What role are patents playing in the market for software innovation based on looking at material technology agreements filed at the SEC?

**A mixed role, supporting the transfer of liability and technology .
But exclusivity provisions don't depend on IP**

How do patent sales support software innovation with respect to the redistribution of rights and capital?

From patent have to patent have not, but money goes the other way, to support tech and liability transfer