# Section 101 and Medical Diagnostics: PTO and Applicant Behavior

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# *Mayo* ("shock and surprise")

- Justice Breyer and "preemption" of cumulative innovation
- *Mayo* two-step ("directed to"; "inventive concept")
  - Back to point of novelty? (though lack of clarity)

# *Alice*: consolidating the *Mayo* two-step

- *Mayo v. Prometheus* (2012)
- *CLS Bank v. Alice* (2014)

- Strange case of *Myriad*

- Step 1: Is patent claim "directed to": law of nature; product of nature; abstract idea
- Step 2: If so, does it have an "inventive concept" or "additional elements" that go beyond unpatentable law of nature, product of nature, abstract idea

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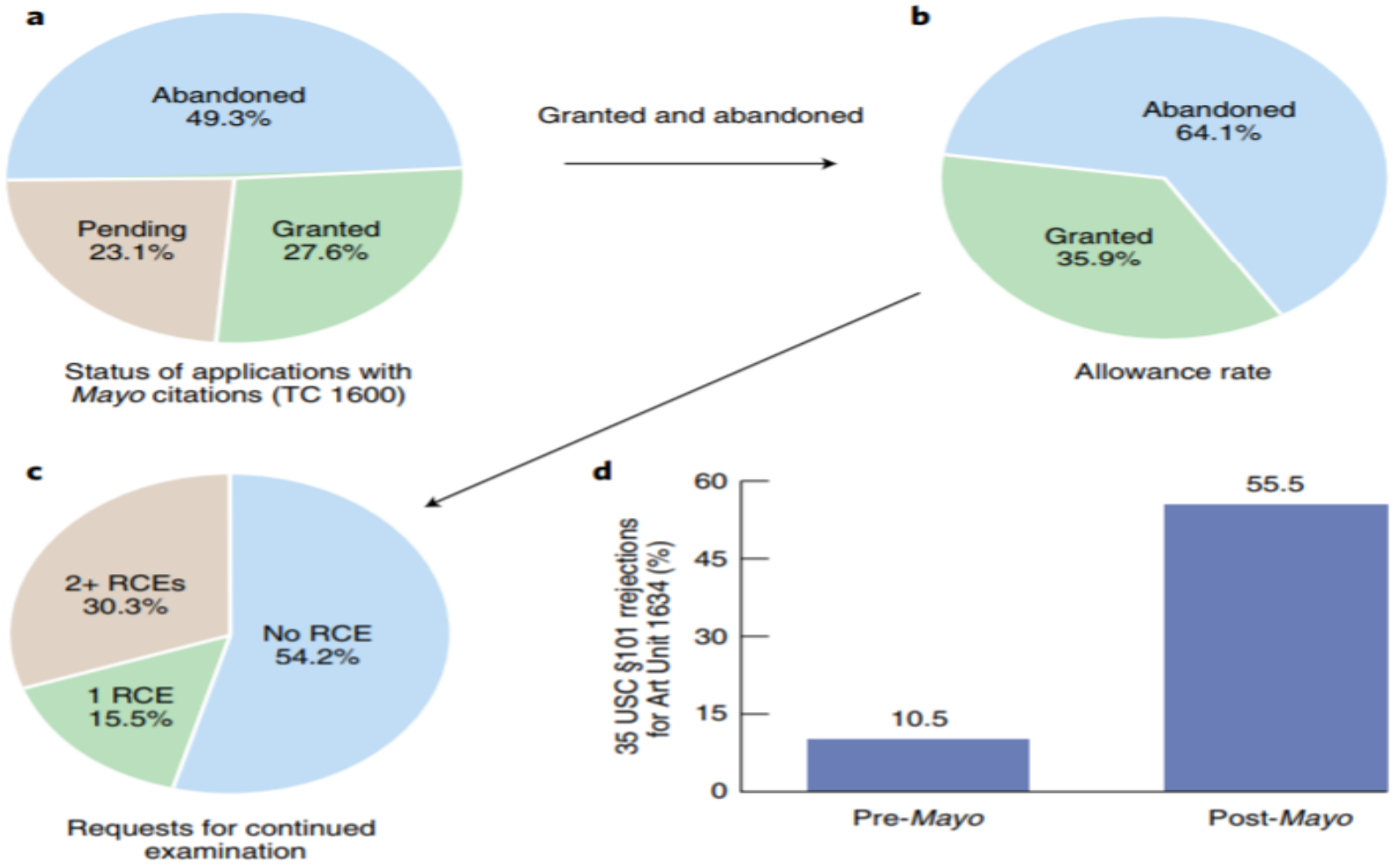
# PTO guidance

- March 4, 2014 guidance on *Mayo* and *Myriad*
- December 16, 2014 guidance (post-*Alice*)
- May 2016 life sciences guidance (liberalizing 101)
  - Famous “julitis” example

From: Aboy et al., *Mayo's Impact on patent applications related to biotechnology, diagnostics, and personalized medicine*, 37 NATURE BIOTECH 513 (2019)

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## *Chien/Rai definition of Med Dx*

"Med Dx" CPCs (biomarker *correlated* to medically relevant utility)

- G01N2800: Detection or diagnosis of diseases (not including disease caused by micro-organisms where the micro-organism is detected); G01N33/569 (detection of bacteria, viruses); G01N33/571 (detection of venereal disease); G01N33/574 (cancer detection)
- C12Q1/6883 and C12Q1/6886 (using nucleic acids to test for disease) (biggest category; 96% true positive)
- C12Q2600/106, 112, and 118 (short nucleic acid sequences used for characterizing disease)

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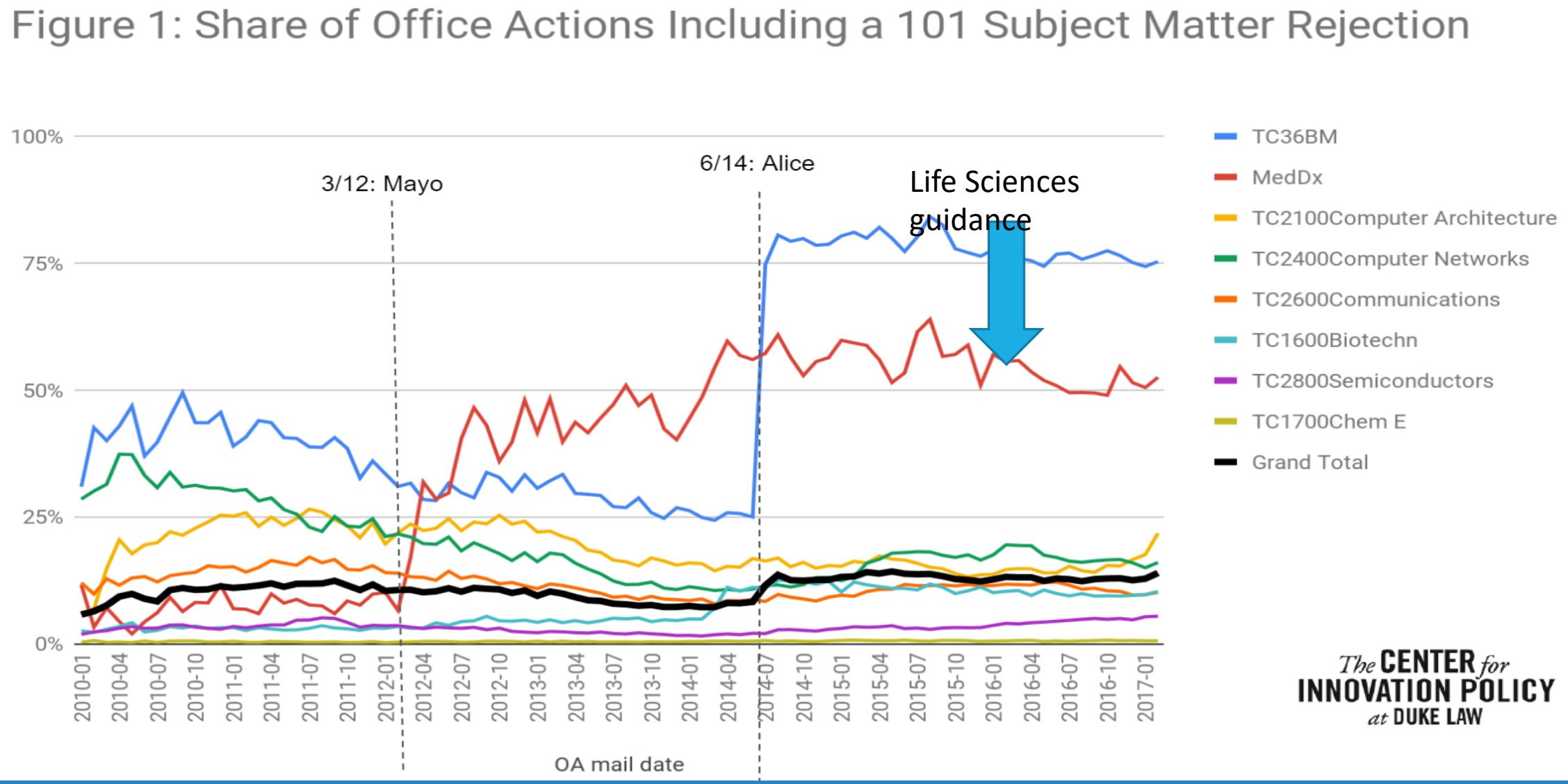
From Chien and Wu, *Patently-O Law Journal* (2018)

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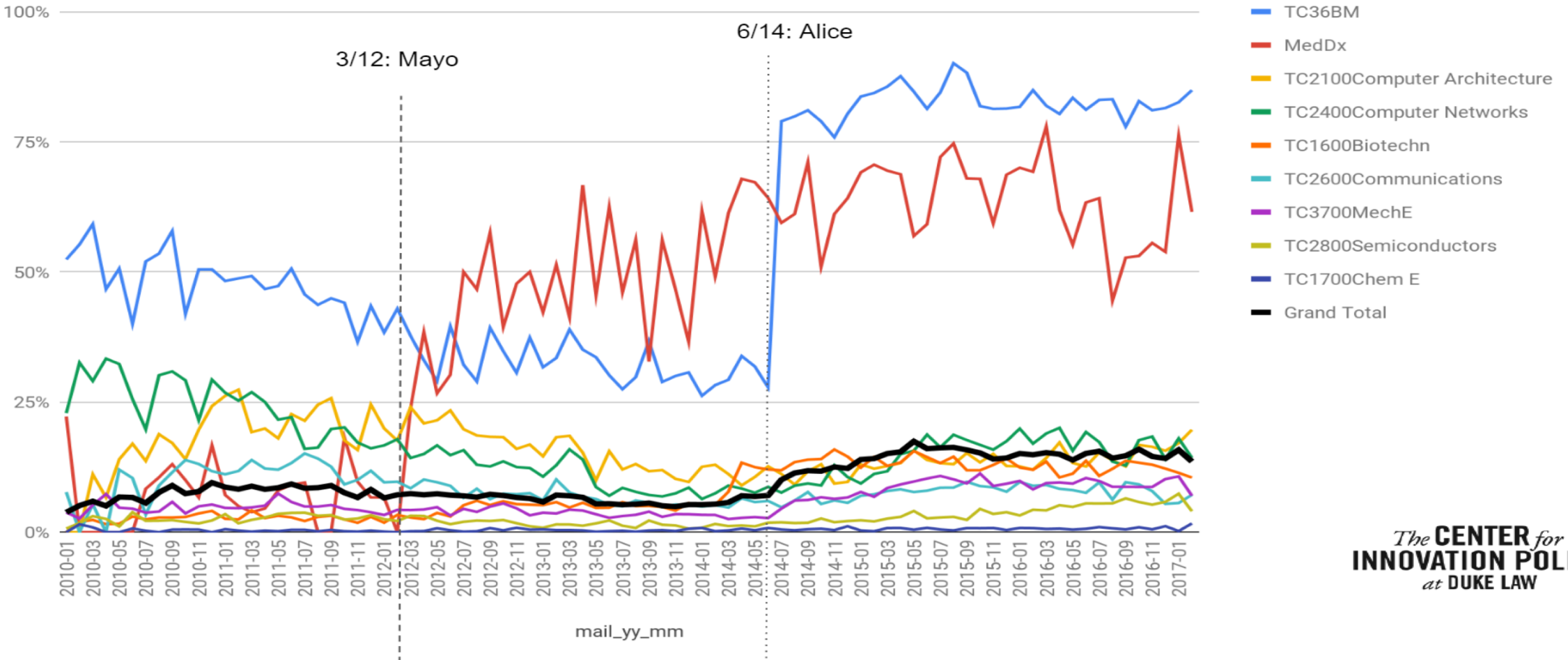
From: Chien & Wu, *Patently-O Law Journal* (2018)

Figure 2: Share of Abandoned Applications with a 101 SM rejection in the last office action pre- Abandonment

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# Federal Circuit on step 1

- *Vanda Pharmaceuticals v. Westward Pharmaceuticals* (April 2018)
  - Method of treatment claims not "directed to" law of nature
- PTO's *Vanda* guidance (states that 2016 guidance had adopted same position for treatment methods – either at step 1 or step 2)

# Vanda VS Mayo

A method for treating a patient with iloperidone, wherein the patient is suffering from schizophrenia, the method comprising the steps of:

determining whether the patient is a CYP2D6 poor metabolizer by:

obtaining or having obtained a biological sample from the patient; and

performing or having performed a genotyping assay on the biological sample to determine if the patient has a CYP2D6 poor metabolizer genotype; and

if the patient has a CYP2D6 poor metabolizer genotype, then internally administering iloperidone to the patient in an amount of 12 mg/day or less, and

if the patient does not have a CYP2D6 poor metabolizer genotype, then internally administering iloperidone to the patient in an amount that is greater than 12 mg/day, up to 24 mg/day,

wherein a risk of QTc prolongation for a patient having a CYP2D6 poor metabolizer genotype is lower following the internal administration of 12 mg/day or less than it would be if the iloperidone were administered in an amount of greater than 12 mg/day, up to 24 mg/day.

A method of optimizing therapeutic efficacy for treatment of an immune-mediated gastrointestinal disorder, comprising:“

(a) administering a drug providing 6-thioguanine to a subject having said immune-mediated gastrointestinal disorder; and

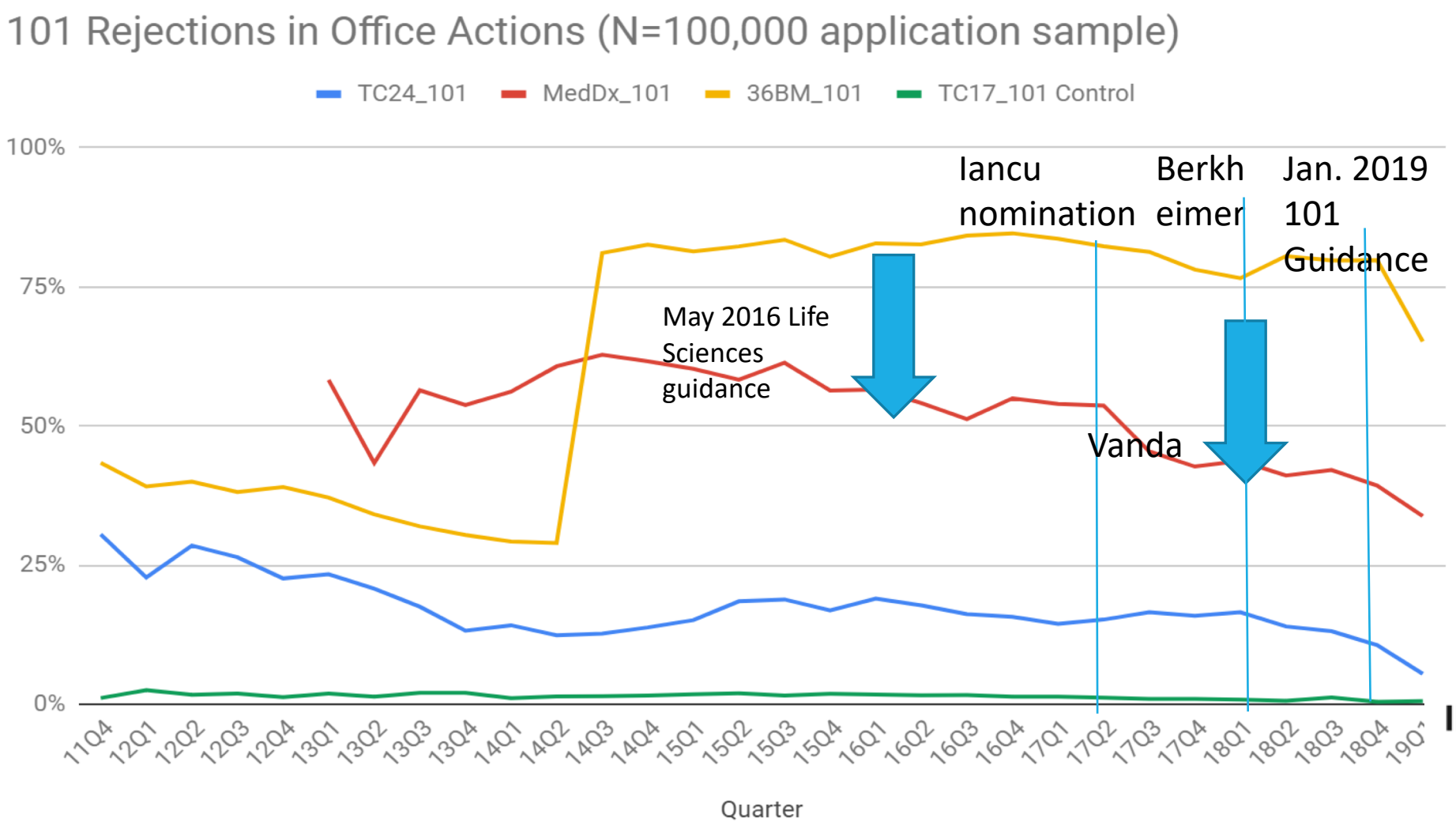
(b) determining the level of 6-thioguanine in said subject having said immune-mediated gastrointestinal disorder, wherein the level of 6-thioguanine less than about 230 pmol per 8×108 red blood cells indicates a need to increase the amount of said drug subsequently administered to said subject and wherein the level of 6-thioguanine greater than about 400 pmol per 8×108 red blood cells indicates a need to decrease the amount of said drug subsequently administered to said subject

# Step 2

- Berkheimer *and* Aatrix *stand for the unremarkable proposition that whether a claim element or combination of elements would have been well-understood, routine, and conventional to a skilled artisan in the relevant field at a particular point in time is a question of fact.*

*Berkheimer v. HP Inc.*, 890 F.3d 1369 (Fed. Cir. 2018) (*en banc* denial) (Judge Moore)

- PTO's April 2018 "Berkheimer" memorandum

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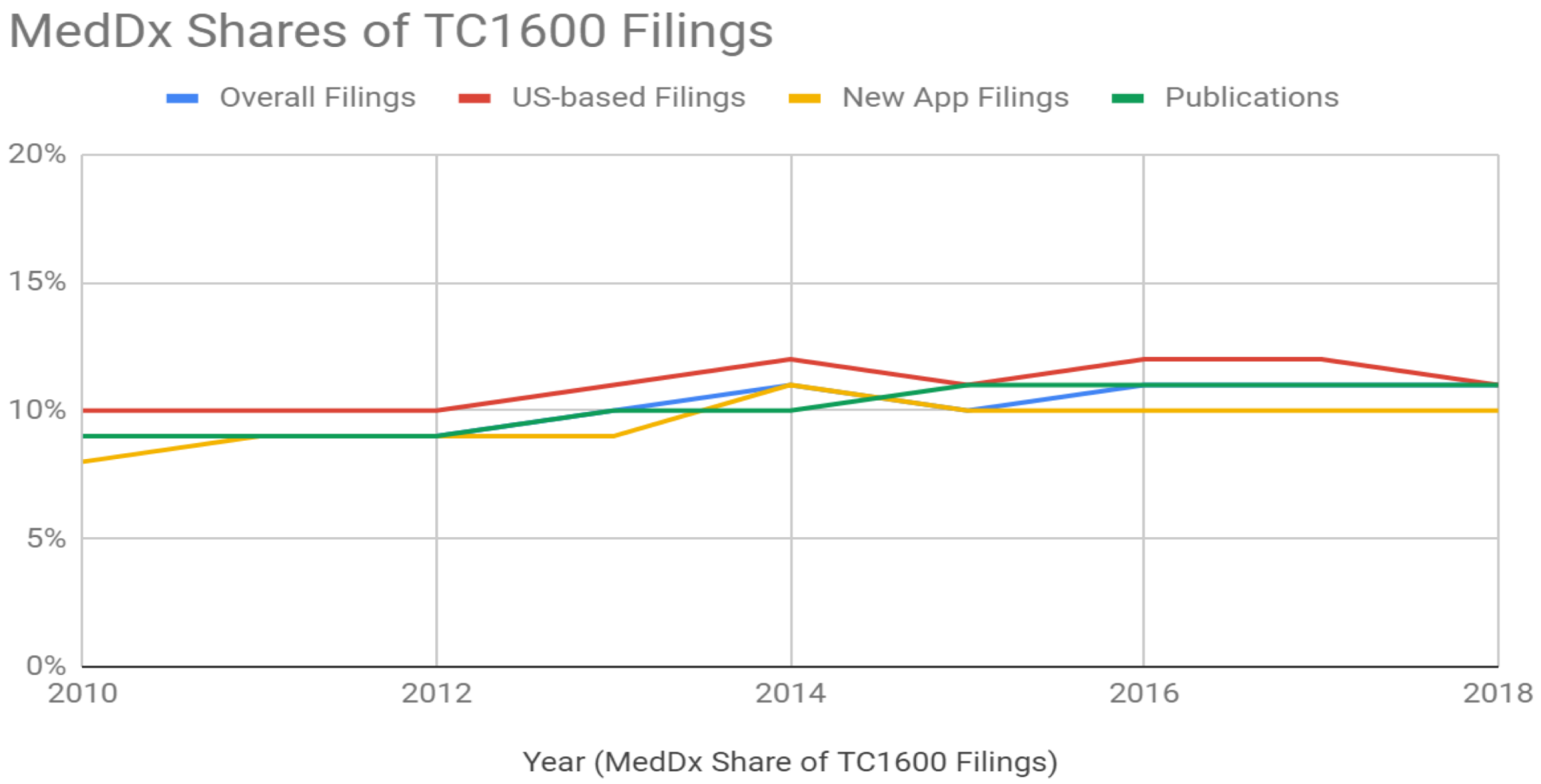
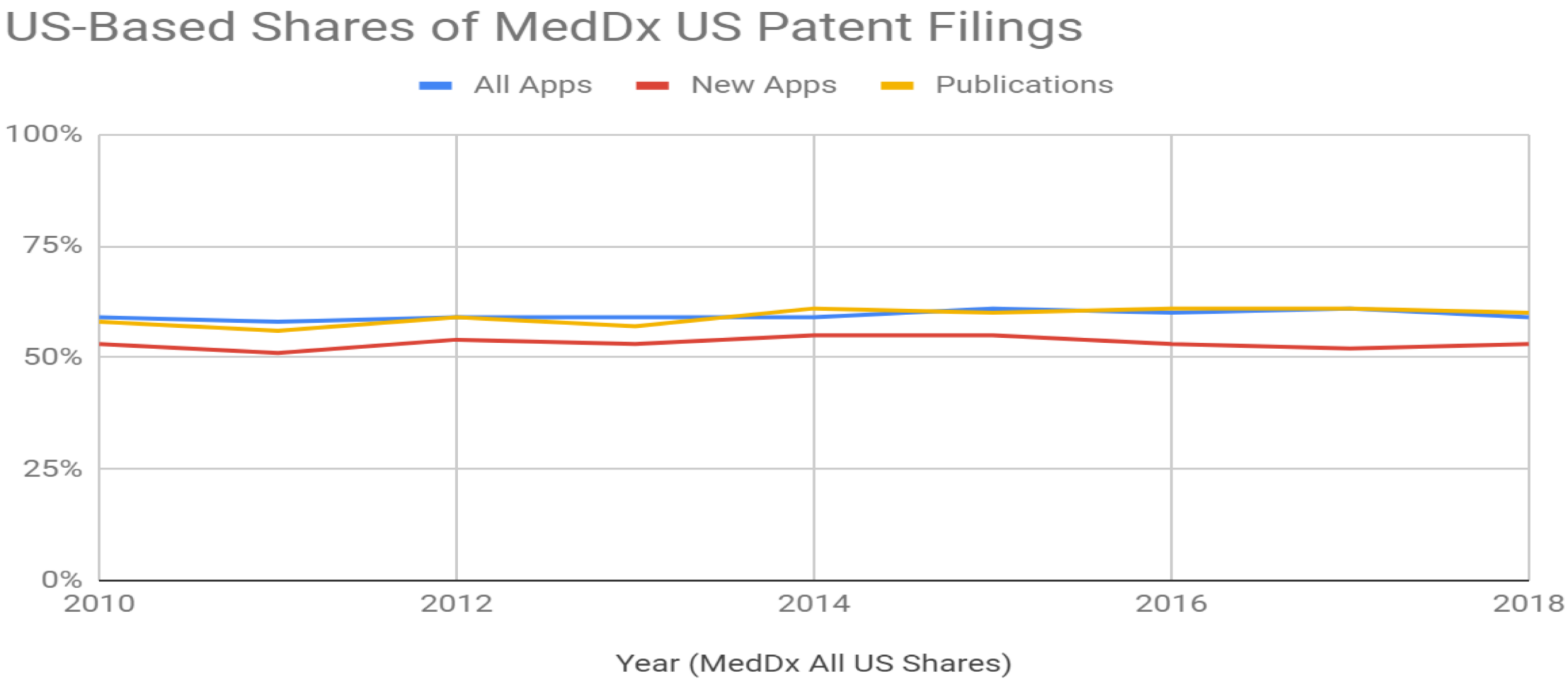
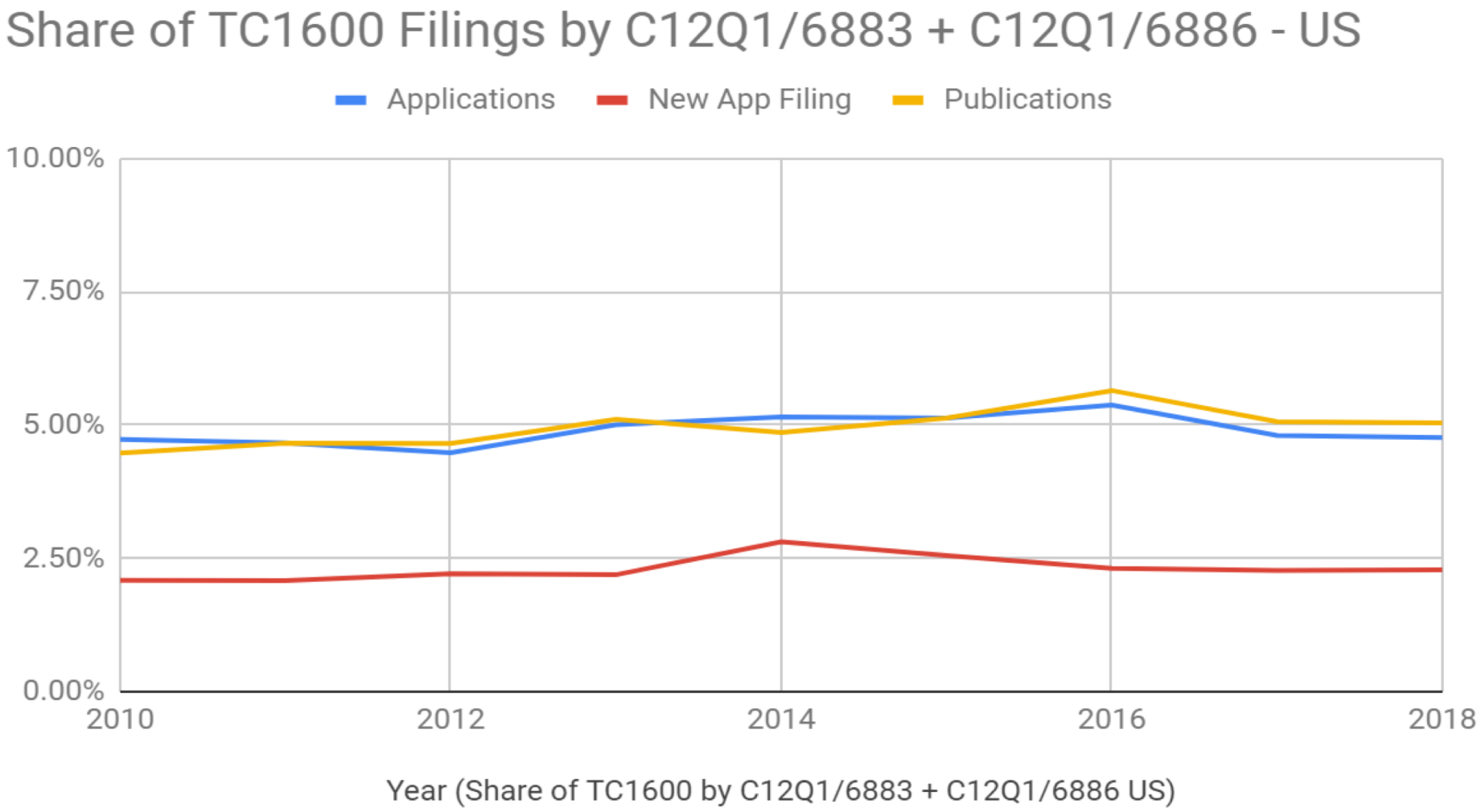
# Effect on *applications*

- Given available evidence on number/percentage of MedDx rejections, abandonment (and very negative bio patent lawyer commentary), should see some effect
  - Differential effects U.S.-based vs. non-U.S. based?
  - Potential (policy-relevant) differences based on entity size/type (non-profit vs. for-profit)?


MedDx Shares of TC1600 Filings
Overall Filings
US-based Filings
New App Filings
Publications
20%
15%
10%
5%
0%
2010
2012
2014
2016
2018
Year (MedDx Share of TC1600 Filings)


US-Based Shares of MedDx US Patent Filings
All Apps
New Apps
Publications
100%
75%
50%
25%
0%
2010
2012
2014
2016
2018
Year (MedDx All US Shares)


Share of TC1600 Filings by C12Q1/6883 + C12Q1/6886 - US
Applications
New App Filing
Publications
10.00%
7.50%
5.00%
2.50%
0.00%
2010
2012
2014
2016
2018
Year (Share of TC1600 by C12Q1/6883 + C12Q1/6886 US)

# Hypotheses being explored

1. Entity size and status effects? (e.g. are small entities, nonprofits less likely to file)
2. Effect of high interest in companion/method of treatment diagnostics (sample whether those are increasing as % of apps)?
3. Patents as signals for VCs (private investment robust – see next slide)

# US-HQ MedDx VC investment data (Data Source: Pitchbook)

| Year | Deal Count | Capital Invested |
|---|---|---|
| 2019 | 155 | 2,063.69 |
| 2018 | 463 | 7,171.32 |
| 2017 | 536 | 5,295.32 |
| 2016 | 529 | 5,595.30 |
| 2015 | 512 | 5,540.76 |
| 2014 | 479 | 3,426.45 |
| 2013 | 397 | 2,188.90 |
| 2012 | 347 | 1,699.08 |
| 2011 | 274 | 3,058.08 |
| 2010 | 298 | 1,877.77 |

Methods:

Deal Date: From: 01-Jan-2010;

Deal Types: All VC Stages; All Round Numbers; All Series

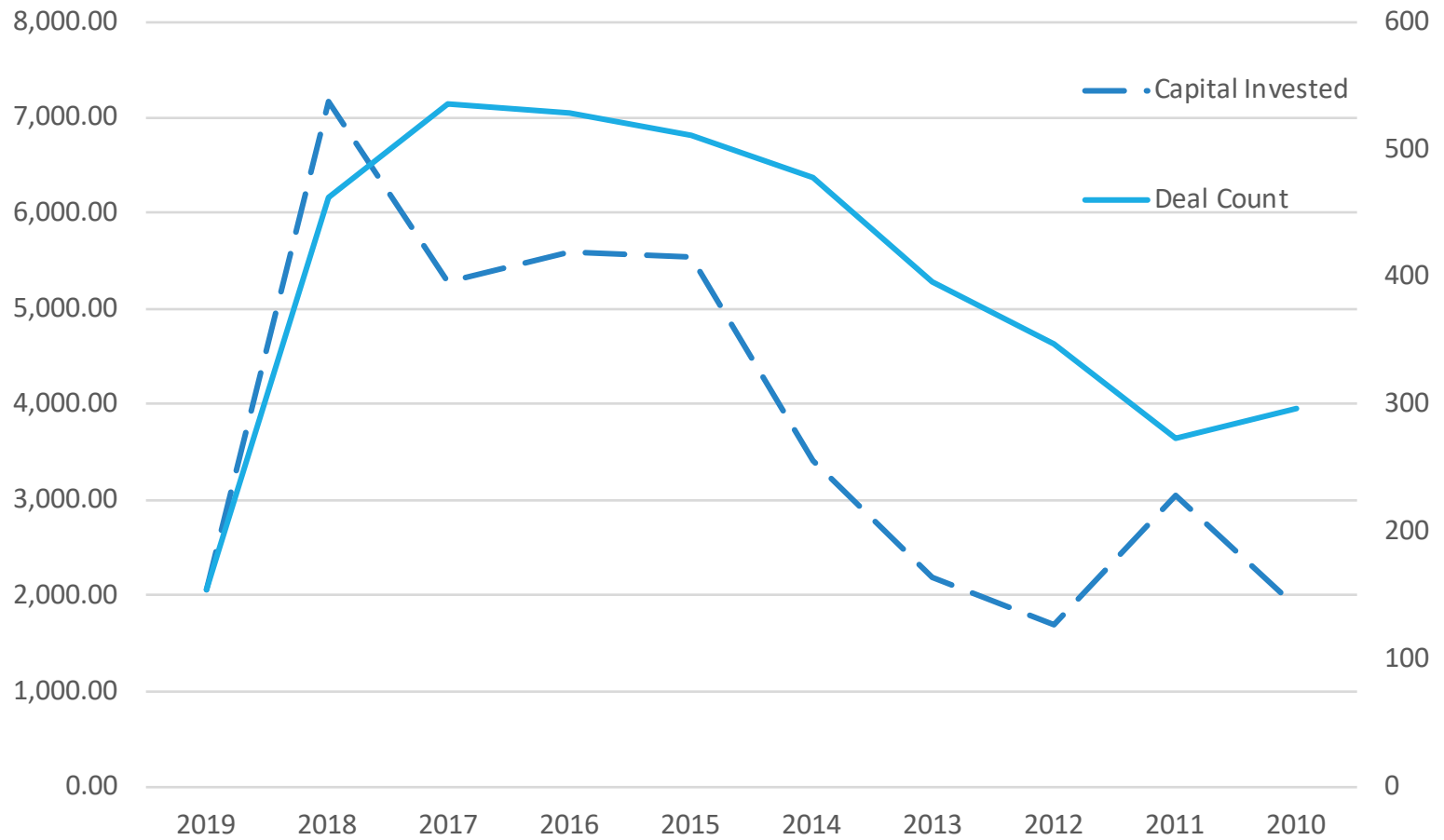
Location: United States (U.S. HQ only)

Keywords: diagnostic testing; molecular diagnostics; diagnostics; infectious disease diagnostics; clinical diagnostics; genetic analysis; genetic testing; blood testing; clinical laboratory services; diagnostic

Added Pitcbhook Suggestions: Laboratory Corporation of America Holdings (NYS: LH); Quest Diagnostics (NYS: DGX); INC Research; Guardant Health (NAS: GH); Invitae (NYS: NVTA); Inivata; Bioclinica; Foundation Medicine; Counsyl; Personalis (NAS: PSNL); BillionToOne; Myriad Genetics (NAS: MYGN); Personal Genome Diagnostics; Caris Life Sciences; Congenica; Admera Health; Genomic Expression; Cancer Genetics (NAS: CGIX); MolecularMD; Medicinal Genomics; Empire Genomics; Pathway Genomics; Affymetrix; ARUP Laboratories; Strata Oncology; 23andMe; Biodesix; Freenome; Exagen; Cynvenio Biosystems.

# US-HQ VC Investment (right to left chronologically)

Capital invested




Deal count

# In conclusion . . .

No topline decrease in patent filings post-*Mayo*; but still testing hypothesis by entity size, entity type

Top filers in MedDx include nonprofits, large companies

After 2012 decline, VC investment trends continue to be robust (perhaps explaining some level of continued filing by small firms)

Broader context of MedDx innovation includes reimbursement and regulatory trends, companion Dx economics