

TLD Traffic Volumes In DNSDB: Year-by-Year Graphs For 2010-2019

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Chapter 1

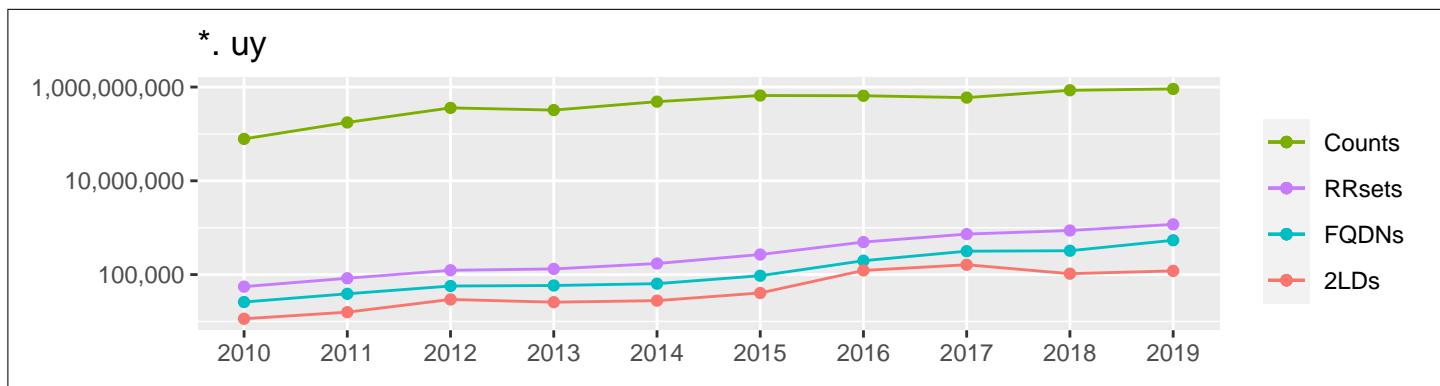
Introduction

Farsight recently reported aggregate passive DNS statistics for all IANA top-level domains ("TLDs") for the period 2010-2019 (see "A Decade Of Passive DNS: A Snapshot of Top-Level Domain Traffic").

In that report, we described the TLD statistics for more than 1500 domains in summary form, but didn't show how traffic changed longitudinally over that time period. This report fills that gap, providing year-by-year statistics for each TLD over the same period. It is based on the yearly MTBL files that Farsight itself uses for DNSDB, our passive DNS database, and which are also provided to DNSDB Export ("DNSDB On Premises") customers.

A. WHAT WE'RE REPORTING

Each TLD has its own graph. A sample graph looks like:



Each graph, including the sample above, has four lines, from top to bottom:

1. **Sum of Counts:** Each RRset has an associated "count" representing the number of times we saw a cache-miss query/response pair for that unique RRset. For example:

```
; ; record times: 2020-08-12 00:04:22 .. 2021-01-18 20:04:15 (~159d 19h 59m)
;; count: 2182; bailiwick: farsightsecurity.com.
www.farsightsecurity.com. AAAA 2620:11c:f008::95
```

```
; ; record times: 2020-08-11 21:45:46 .. 2021-01-18 23:55:47 (~160d 2h 10m)
;; count: 4934; bailiwick: farsightsecurity.com.
www.farsightsecurity.com. A 104.244.14.95
```

Looking at just those couple of RRsets, the "sum of counts" would be $2,182 + 4,934 = 7,116$. (Most TLDs will have many RRsets to sum up, not just the couple shown here for illustration purposes.)

2. **Unique RRsets:** DNSDB separately tracks each unique combination of (RRname, RRtype, Bailiwick, Rdata and Zone/Sensor Source). For example, two of many unique RRsets for www.farsightsecurity.com would be:

```
; ; record times: 2020-08-12 00:04:22 .. 2021-01-18 20:04:15 (~159d 19h 59m)
; ; count: 2182; bailiwick: farsightsecurity.com.
www.farsightsecurity.com. AAAA 2620:11c:f008::95
```

```
; ; record times: 2020-08-11 21:45:46 .. 2021-01-18 23:55:47 (~160d 2h 10m)
; ; count: 4934; bailiwick: farsightsecurity.com.
www.farsightsecurity.com. A 104.244.14.95
```

Those RRsets are tracked separately because the record types ("A" vs. "AAAA") and the associated Rdata ("2620:11c:f008::95" and "104.244.14.94") differ. Other RRsets may differ in other respects, such as having different RRnames, different bailiwicks, or having been collected from sensors vs having been seen in zone file data, etc.

ANY combination of RRname, RRtype, Bailiwick, Rdata and Zone/Sensor Source that differs in ANY way from previously seen combinations will be tracked as a new unique RRset with its own associated "time first seen", "time last seen", and "count".

3. **Unique FQDNs (Fully Qualified Domain Names):** These are the set of unique RRname values (sometimes simply called "hostnames"). Examples of a few unique RRnames (in this case from the washington.edu domain) include:

```
biochemistry.washington.edu.
chem.washington.edu.
cis.washington.edu.
climate.washington.edu.
dept.washington.edu.
econ.washington.edu.
```

Note that each of those domains has a "hostname" part tacked onto the washington.edu delegation point. In Table I below, we report the total number of unique FQDNs within each IANA-recognized top level domain for the decade's worth of data.

4. **Unique Effective 2nd-Level Domains:** These are unique delegation points. Some example of effective 2nd-level domains include:

```
farsightsecurity.com
fsi.io
dnsdb.info
```

The three examples mentioned above all feature domains registered immediately above a single label top-level domain.

Some domains get registered above an effective top-level domain that is composed of two or more labels. For example:

- `bbc.co.uk` is a domain name that was registered above "`co.uk`" (rather than just above "`uk`")
- `springfield.k12.or.us` is a domain name that was registered above "`k12.or.us`" (rather than just above "`us`")

We look to the Public Suffix List (see <https://publicsuffix.org/>) for details about what constitutes an effective top-level domain.

In the event that you ever forget what line on the graph represents a particular measure, note that the "key" or "legend" on the right matches the four lines on the graph.

B. HOW THE GRAPHS ARE ORGANIZED

The report's graphs are organized according to the magnitude of the Y axis shown in the graphs. (The top Y axis value may actually be a bit above or a bit below the highest Y value, but as a way of roughly sorting graphs by magnitude, this is a fairly robust approach.) The categories are:

- Hundreds of billions and above (Chapter 3)
- Tens of billions (Chapter 4)
- Billions (Chapter 5)
- Hundreds of millions (Chapter 6)
- Tens of millions (Chapter 7)
- Millions (Chapter 8)
- Hundreds of thousands (and below) (Chapter 9)
- Domains that are revoked/retired (Chapter 10)
- IANA TLDs with no traffic from 6/2010 to 12/2019 (Chapter 11)

If you're not sure where to find a given domain, note that we've provided a hyperlinked index at the back of the report – you can simply click on the page number of an item of interest to jump directly to that specific domain.

Chapter 2

Limitations/Interpretative Considerations

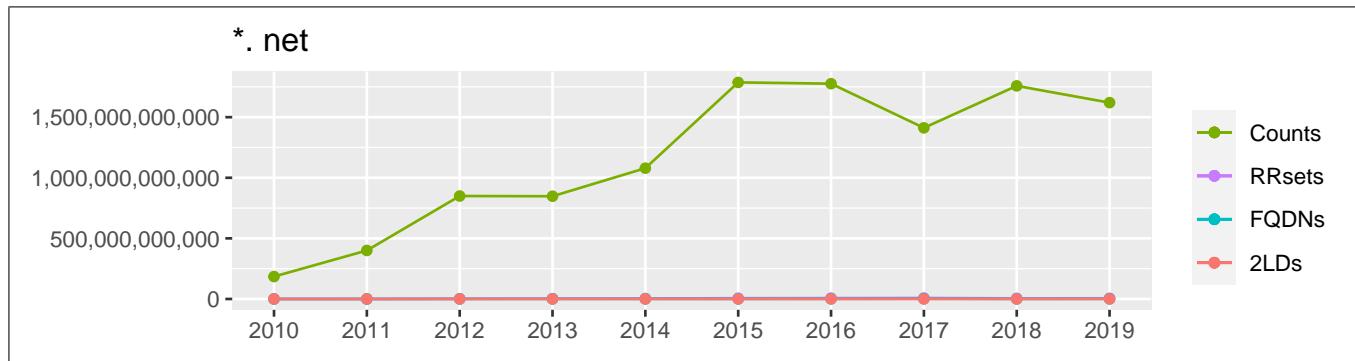
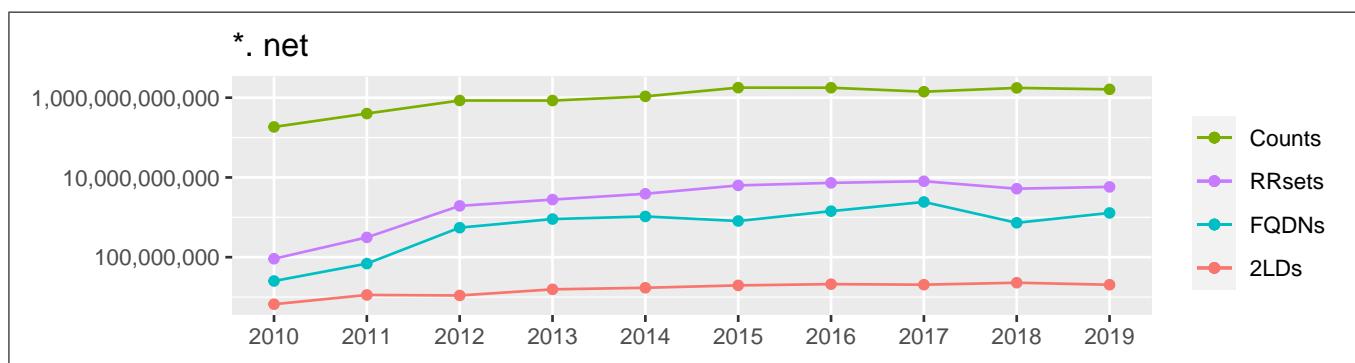
A number of factors need to be recognized when viewing and interpreting the results in this report, including the following:

- **Our Sensor Footprint Is Global, But Not Ubiquitous:** While we see a tremendous volume of DNS traffic, and are continually working to improve our sensor coverage, we will never be able to see "all" global DNS traffic. There is a possibility that our passive DNS sensors may NOT have visibility into a particularly exotic TLD that is largely used only in some remote corner of the world where we don't currently have sensor coverage. We've not seen any evidence of issues of this sort, but we acknowledge this potential limitation.

If you think we're not seeing representative traffic for your favorite TLD, we're always happy to work to take traffic from additional locations. If you operate recursive resolvers for an ISP, college or university, large company, government agency or similar outfit, we'd be happy to talk with you about contributing data to DNSDB.

- **We Collect Cache Miss Traffic Above Recursive Resolvers, And That Collection Is Impacted By Domain Owner TTL Choices:** We intentionally collect passive DNS data in a privacy-respectful way, via sensors located above participating recursive resolvers. This means that we only see (and index) cache miss traffic, not each individual end-user's queries and responses. The cache miss traffic volume we see is obviously influenced by the popularity of each domain, but is also strongly influenced by the TTL (or "time to live") value set by the domain owner. While we have no reason to believe that there are TLD-wide TTL patterns that might impact relative data values (for example, we have NO REASON to believe that dot net domains tend to generally have long TTLs while dot org domains tend to generally have short TTLs, or vice versa), TTLs are constantly changing and we've not formally studied and excluded this possibility.
- **DNSDB Is Actively Curated:** Farsight intentionally strives to maintain a good DNSDB signal-to-noise ratio – no analyst is happy when their query returns numerous spurious records that are clearly irrelevant to their analysis. Part of that proprietary curation process involves managing domains that are low-value, privacy sensitive, or otherwise problematic. As an example, we've previously discussed sites running VPN-over-DNS services (see "RECORD TYPE=NULL Records In DNSDB Mtbl Files," <https://www.farsightsecurity.com/blog/txt-record/recordtype-null-20170308/>). Those records are either (a) encrypted (and thus of limited use to typical Farsight customers), or (b) not-encrypted and potentially privacy sensitive, and either way, those records tend to be large and poorly compressible since each RRset is unique/non-recurring. We do our best to manage those records and similar problematic records when we detect them.
- **Please Note That We're Showing Log-Linear Graphs** The bulk of this report consists of graphs. Because of their central role in this document, we want to make sure you interpret them correctly. In particular, because there's a large range of values being reported, each graph has a **logarithmic Y axis**.

To see the problem if we DON'T use a logarithmic Y axis, compare the data for the dot net TLD when plotted on a linear axis vs a log-linear axis:

Linear Y Axis:**Log Y Axis:**

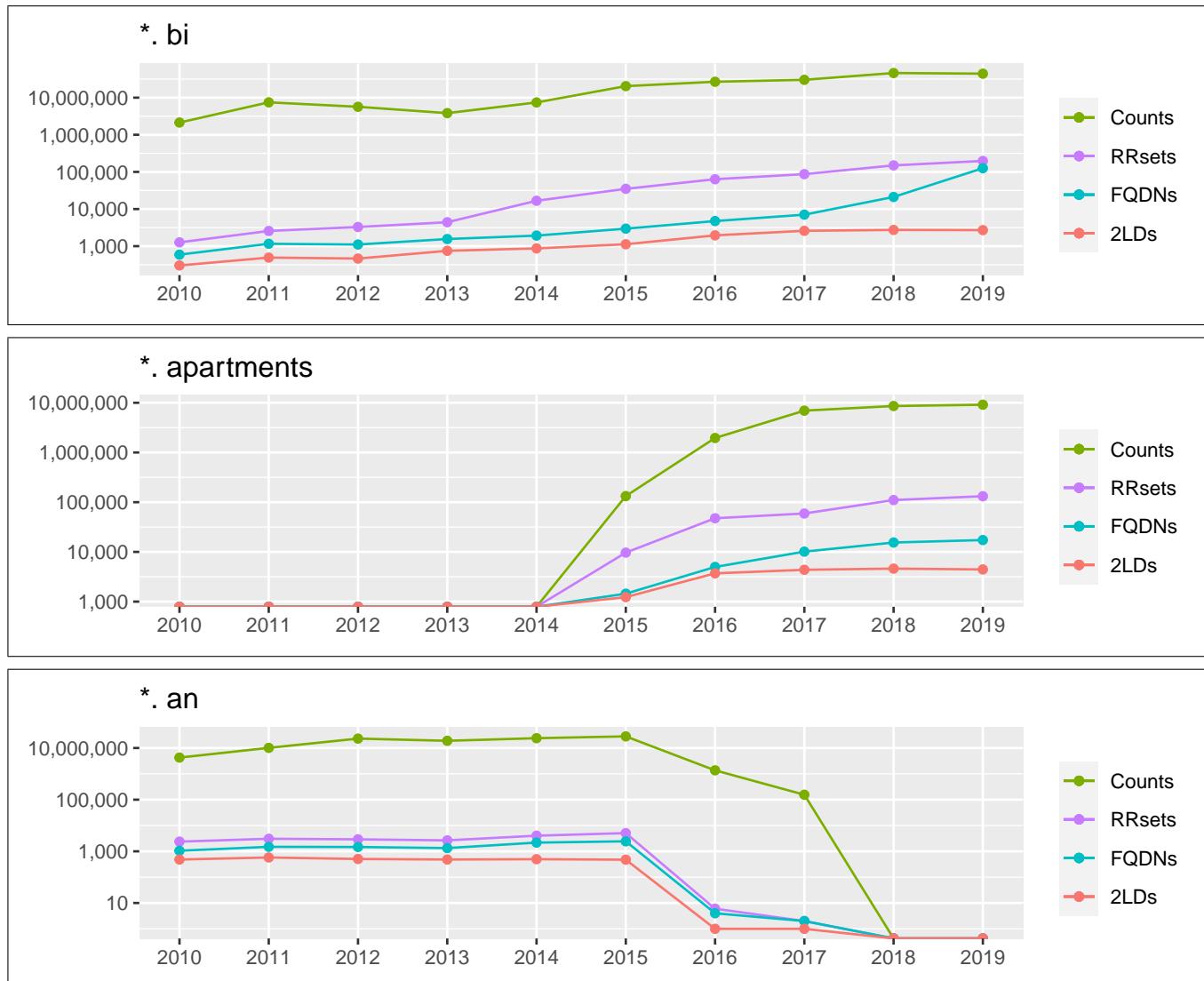
When you look at the linear plot, you may think that we've "forgotten" or "overlooked" two of the lines. Not so. All four lines were drawn, but due to the extreme scale of the "sum of counts", the other three lines were drawn "right on top of each other" with only the last being visible (and none of the three exhibiting discernible variation). Now you see why we need logged Y axes!

When looking at data plotted on a logged Y axis, remember that even seemingly small increases or decreases can translate to big changes.

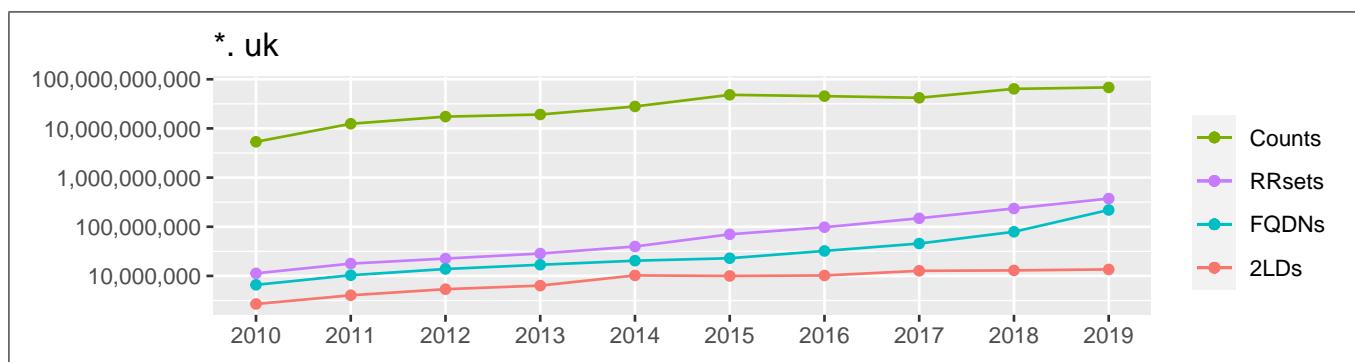
- **We're Showing Yearly Counts** When many of the graphs are monotonically increasing, you may forget that each point represents a YEARLY value – these values are NOT cumulative. The values for 2016, for example, are NOT based on 2015 plus some increment. The values for each year are computed on their own/in their own right.
- **We're Combining All Domains Within Each TLD** Each graph is reflecting the aggregate of all the domains under that TLD. The extreme activity of one delegation point within a TLD may be implicitly "buffered" or "washed out" by low activity from dozens of other domains in some cases.

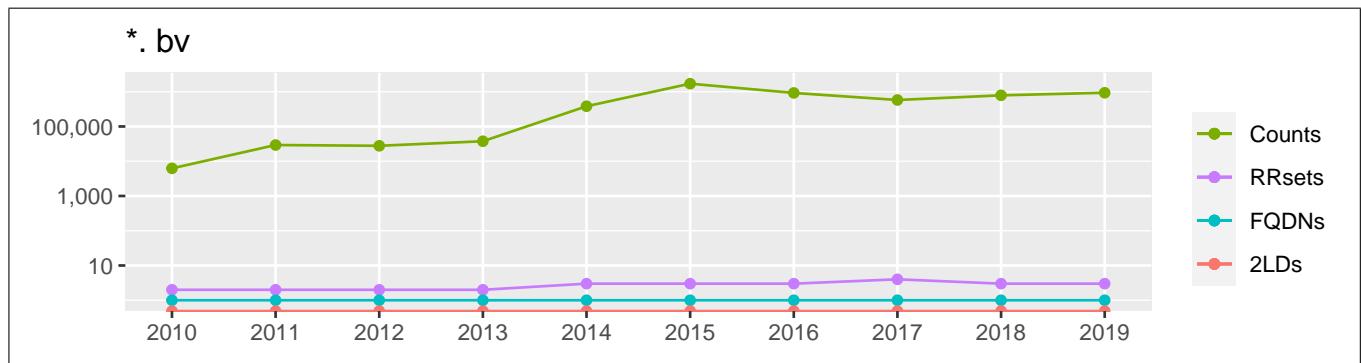
"SO WHAT INSIGHTS CAN WE DRAW FROM ALL THESE GRAPHS?"

- **When Did A Domain Start/Stop Being Used?** Was the domain in operation before the middle of 2010, or is it a domain that became active some time after that? Is the domain still active? Let's contrast dot "bi" (Burundi) vs. dot "apartments" vs. dot "an" (formerly the Netherland Antilles):

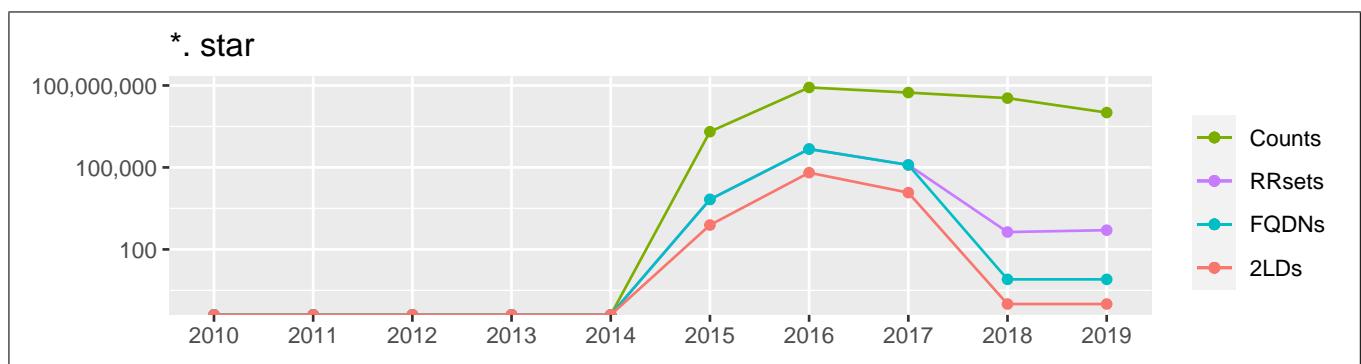
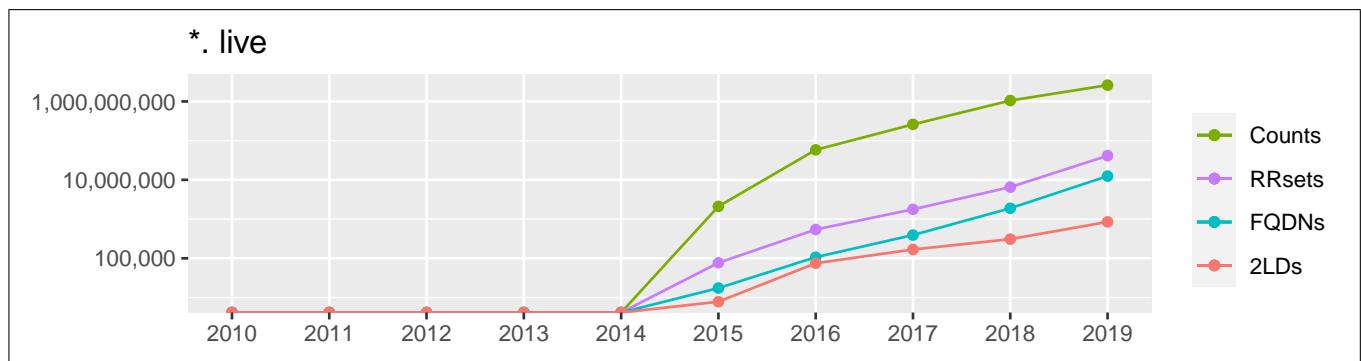


- **Relative Size:** You can get a sense of the relative "magnitude" of the various TLDs by looking at the volumes associated with each domain. Compare, for example, dot "uk" (the domain for the United Kingdom) with dot "bv" (the domain for Bouvet Island, an uninhabited subantarctic island that's a dependency of Norway). Looking at the scale of the Y axis, it's obvious which is larger.

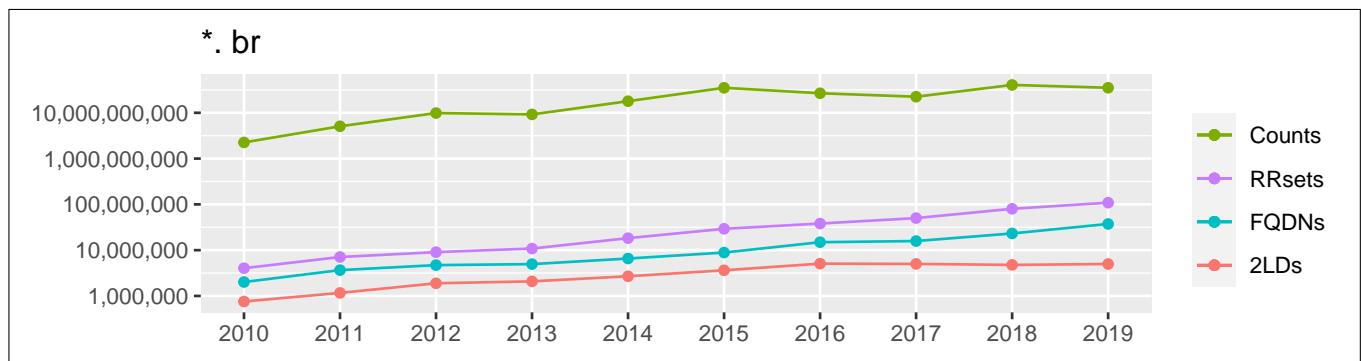


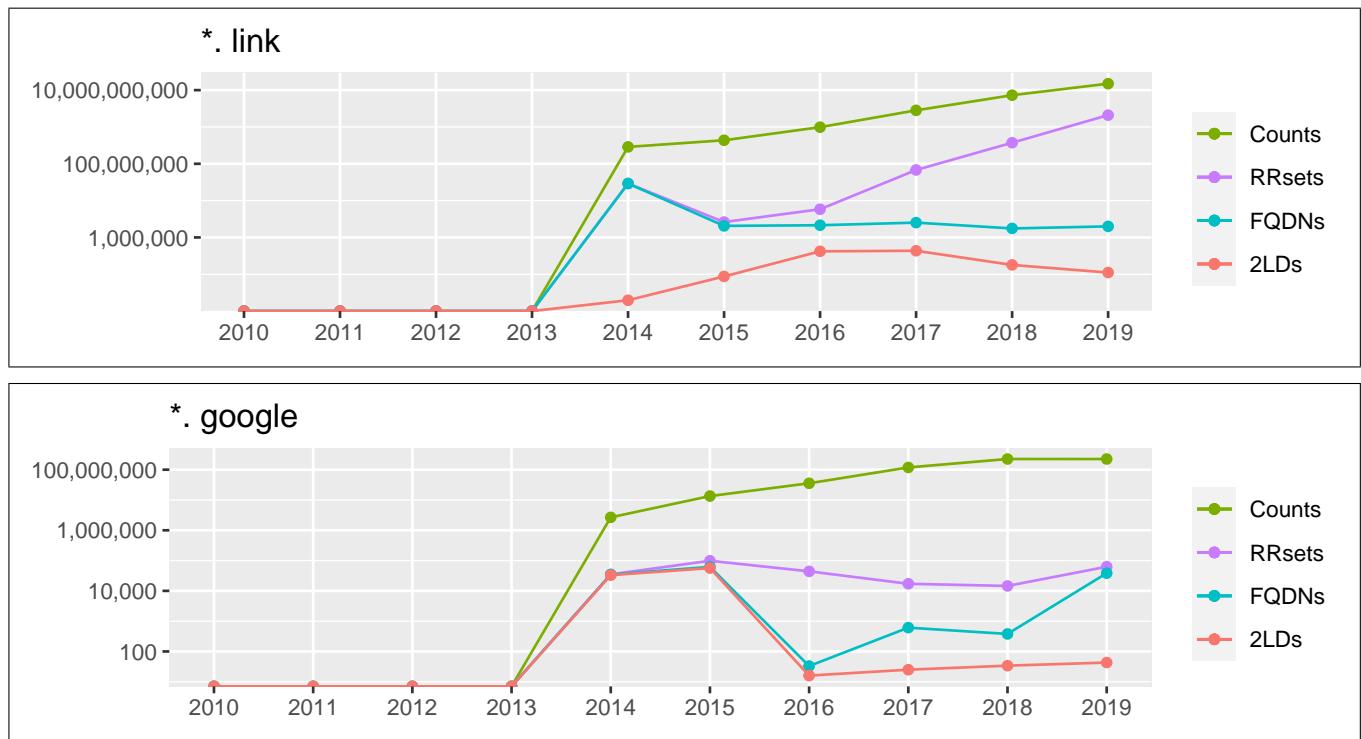


- **How Is The Domain Changing?** You can tell how domain usage is evolving – does it continue to grow over time, or has it been level, or has it even declined? Compare the 2LDs for dot "live" vs. dot "star":



- **Ratio of Unique 2LDs to Unique FQDNs to RRsets to Cache Miss Counts** Are the four lines consistently roughly parallel? Or do the lines have varying slopes? Compare dot "br" vs. dot "link" vs. dot "google":



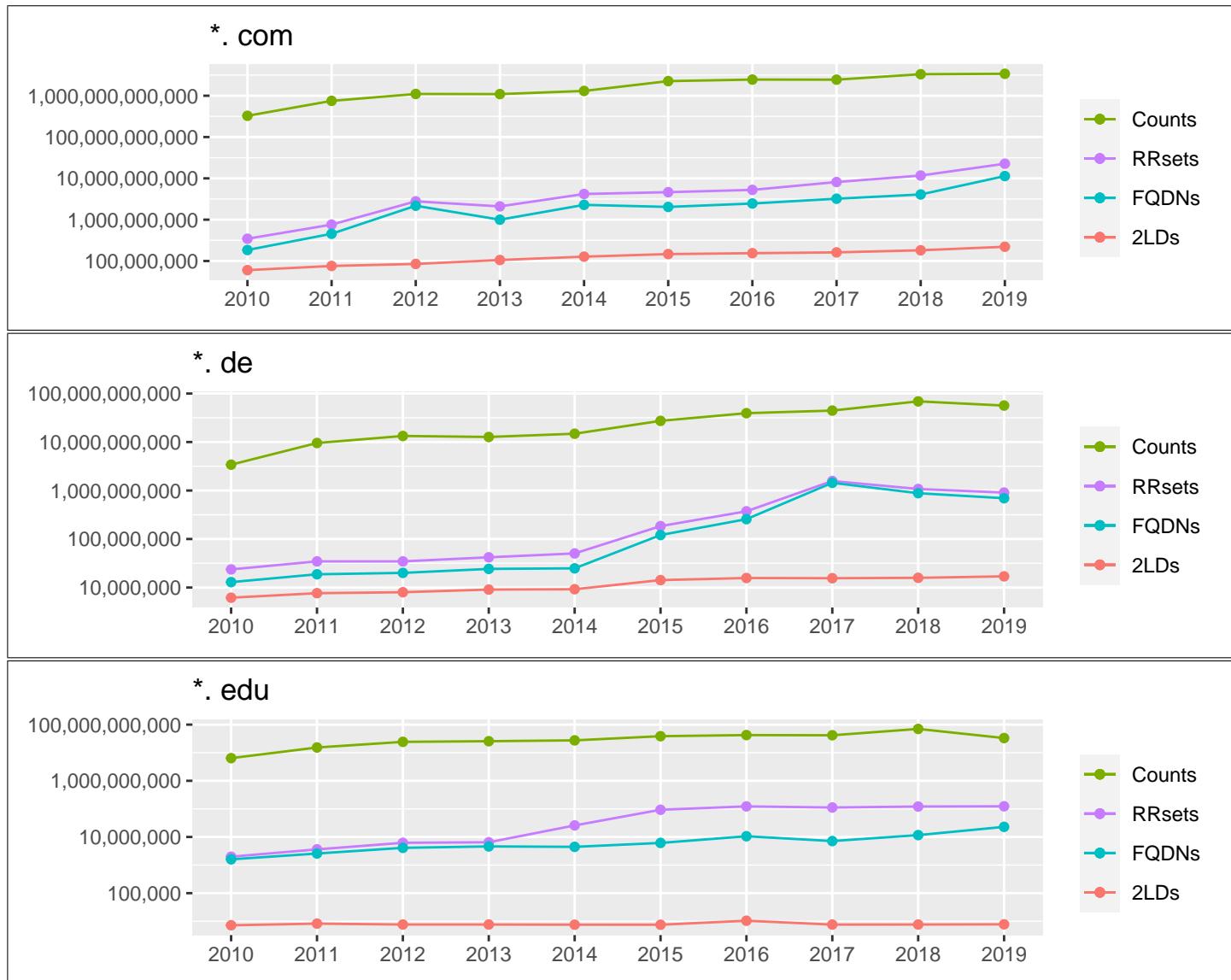


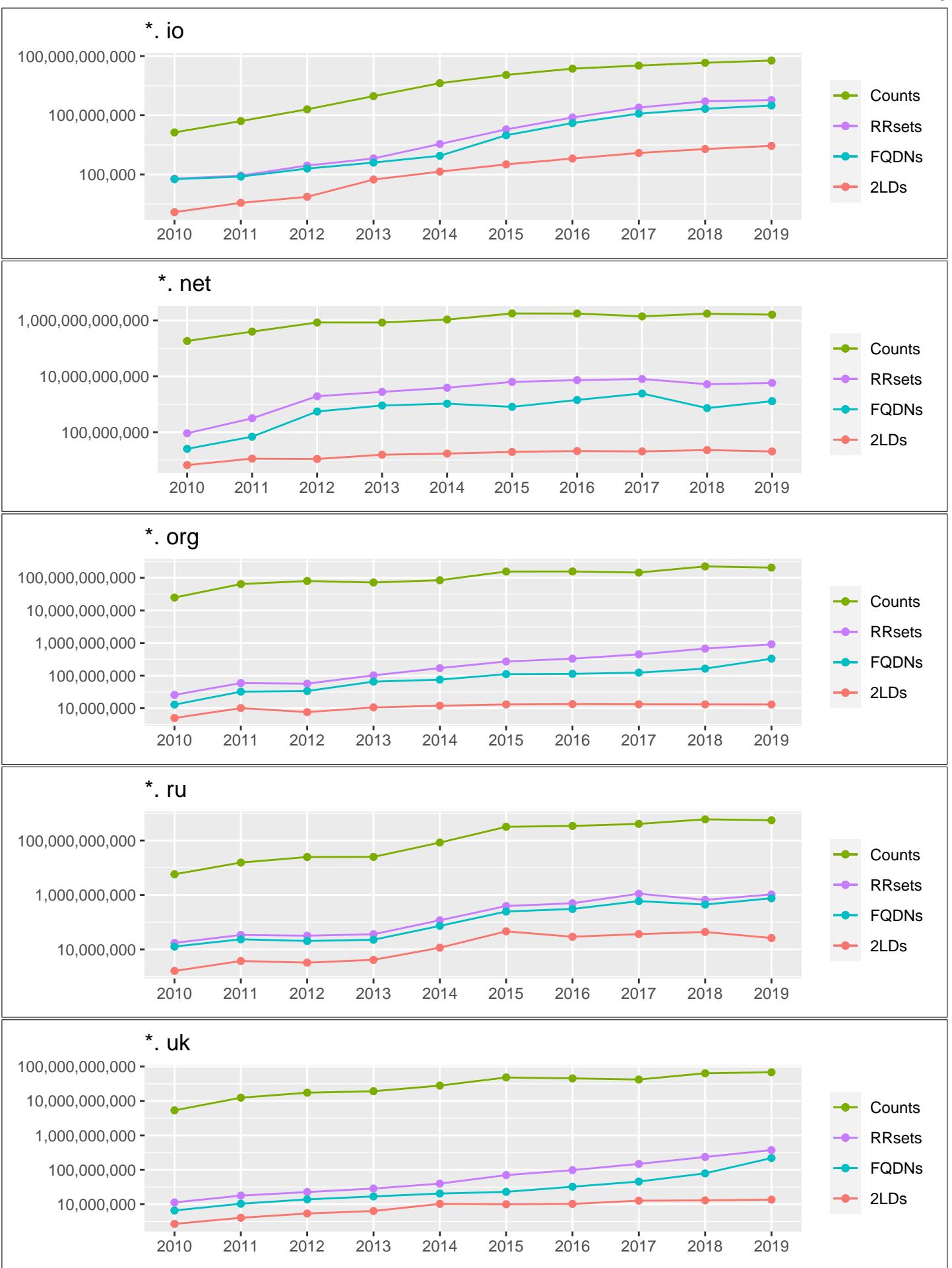
But now let's look at the actual data. We'll begin with the largest of domains, those that have scales of trillions (e.g., dot "com" and dot "net") or hundreds of billions (dot "de", dot "edu", dot "io", dot "org", dot "ru", and dot "uk").

If you'd rather jump directly to a particular domain of interest, remember that the index at the back of this document is hyperlinked to each domain.

Chapter 3

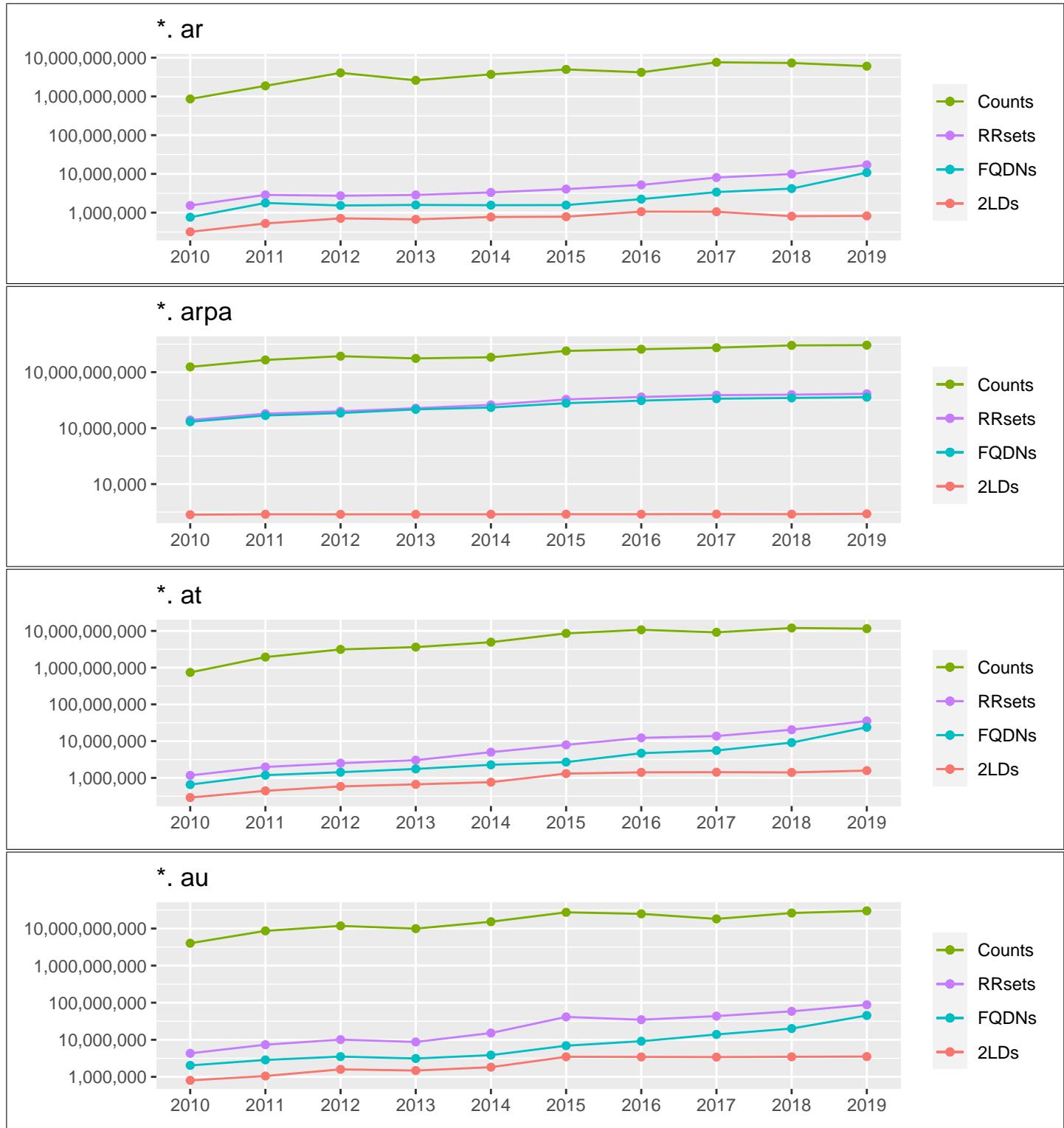
Domains With Observed Counts of Hundreds of Billions and Above

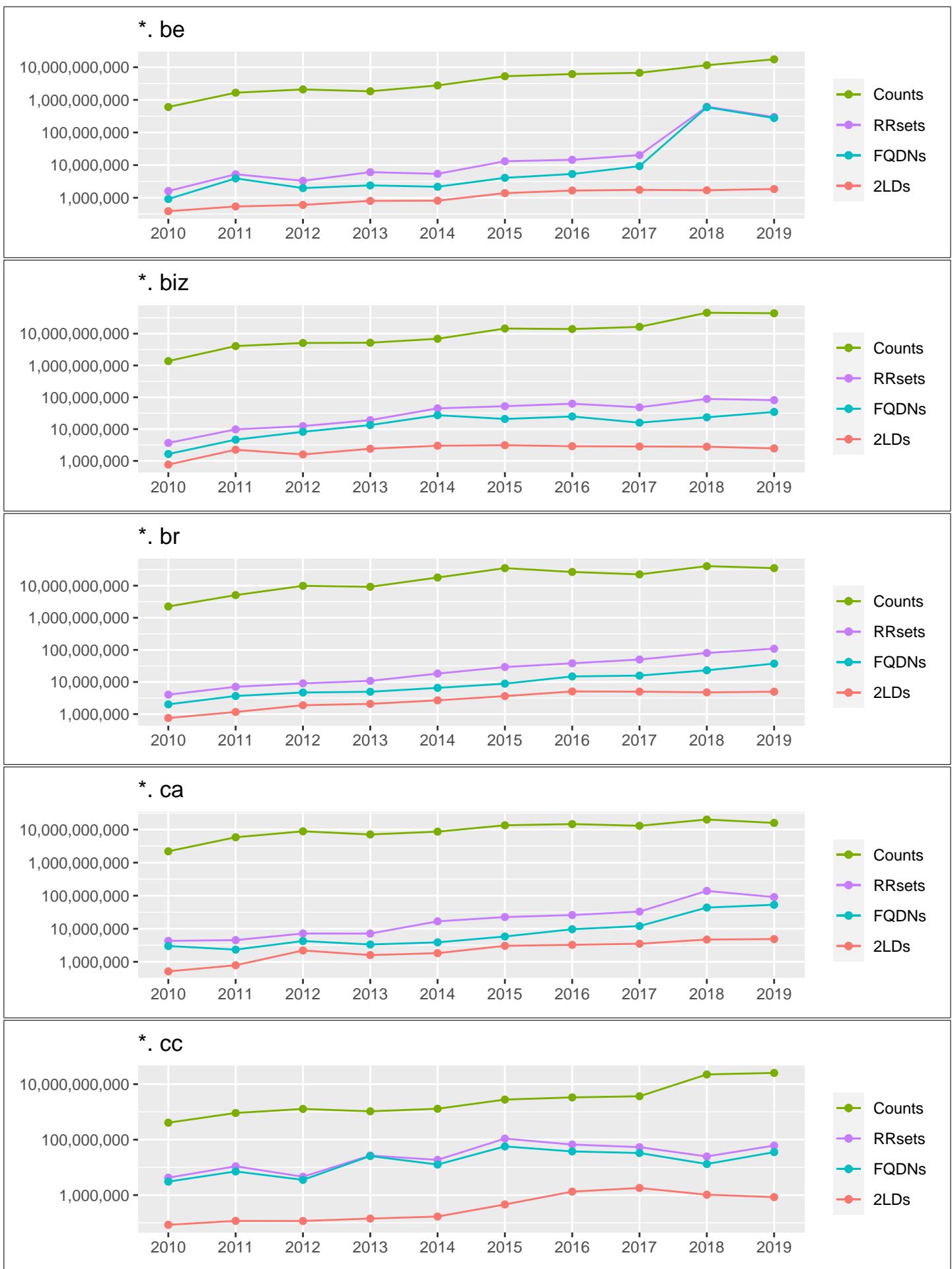


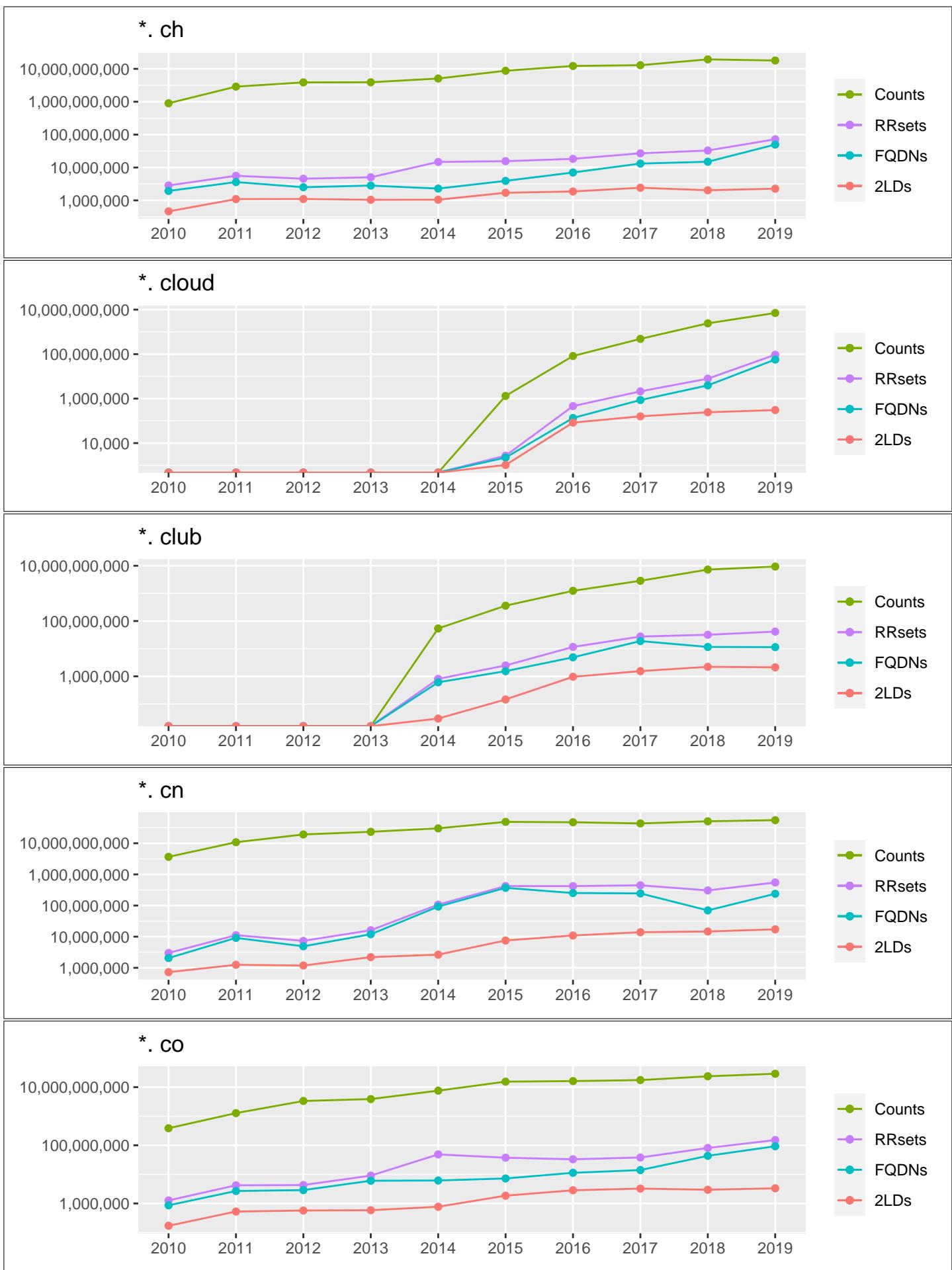


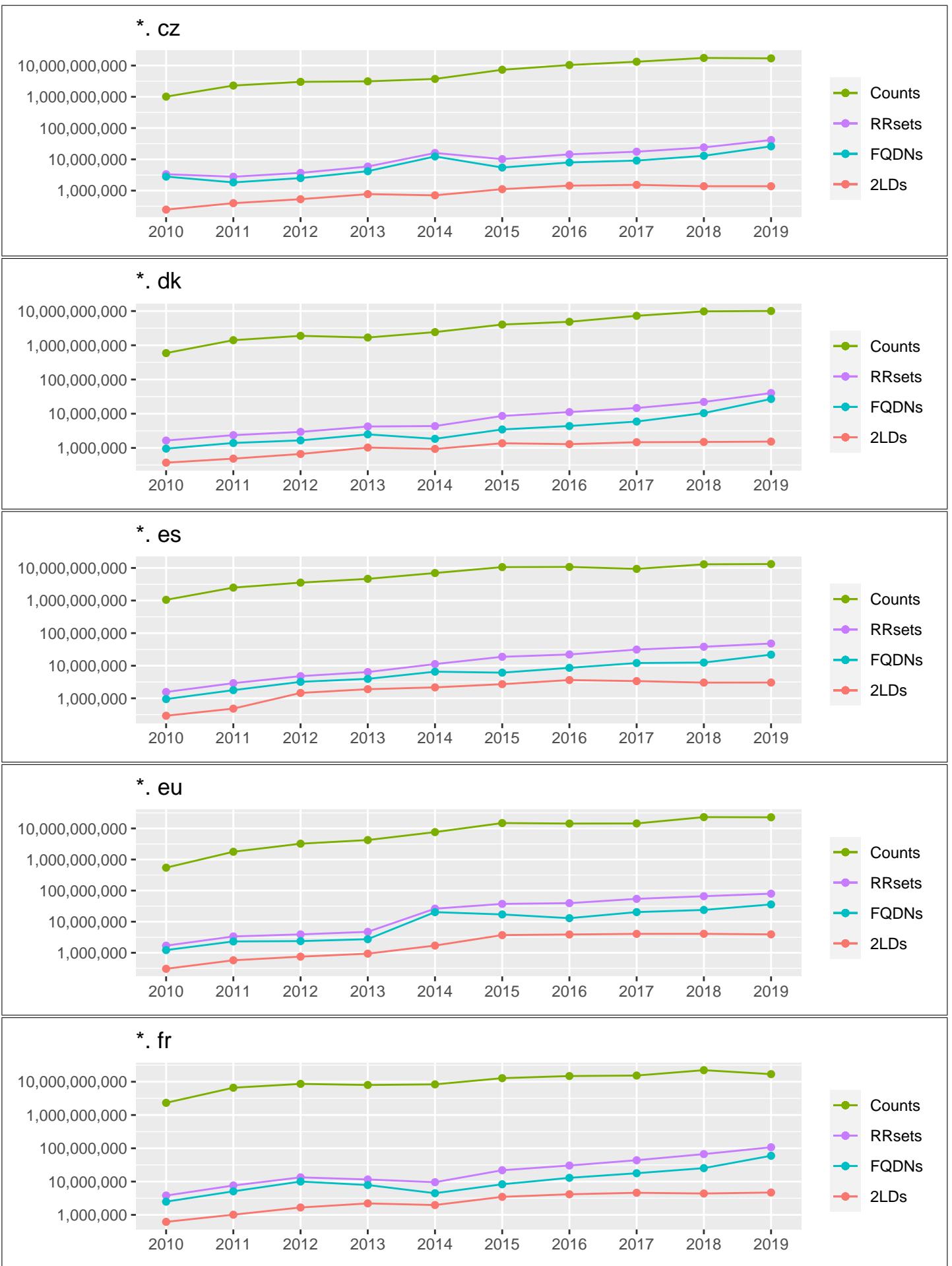
Chapter 4

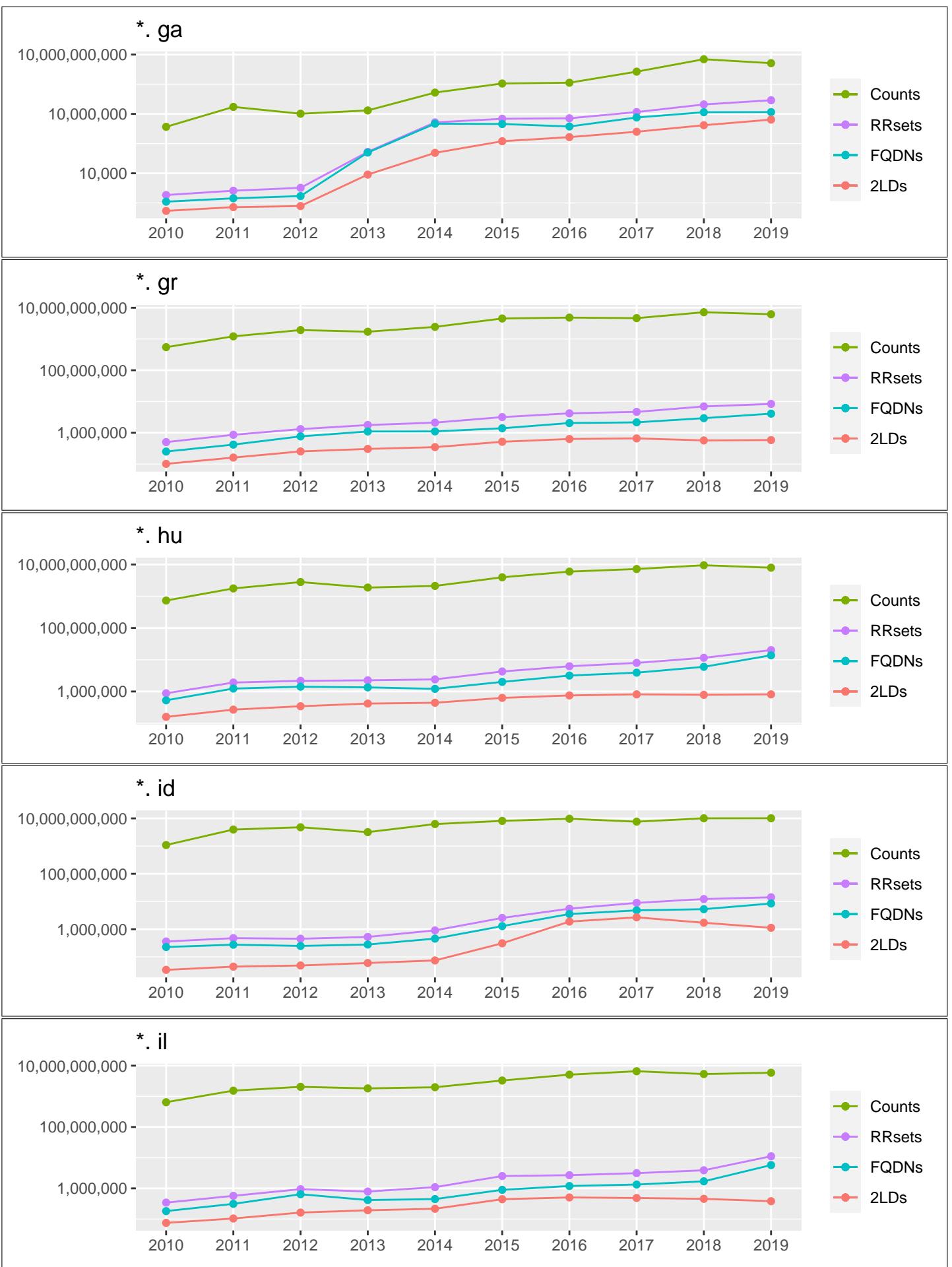
Tens of Billions

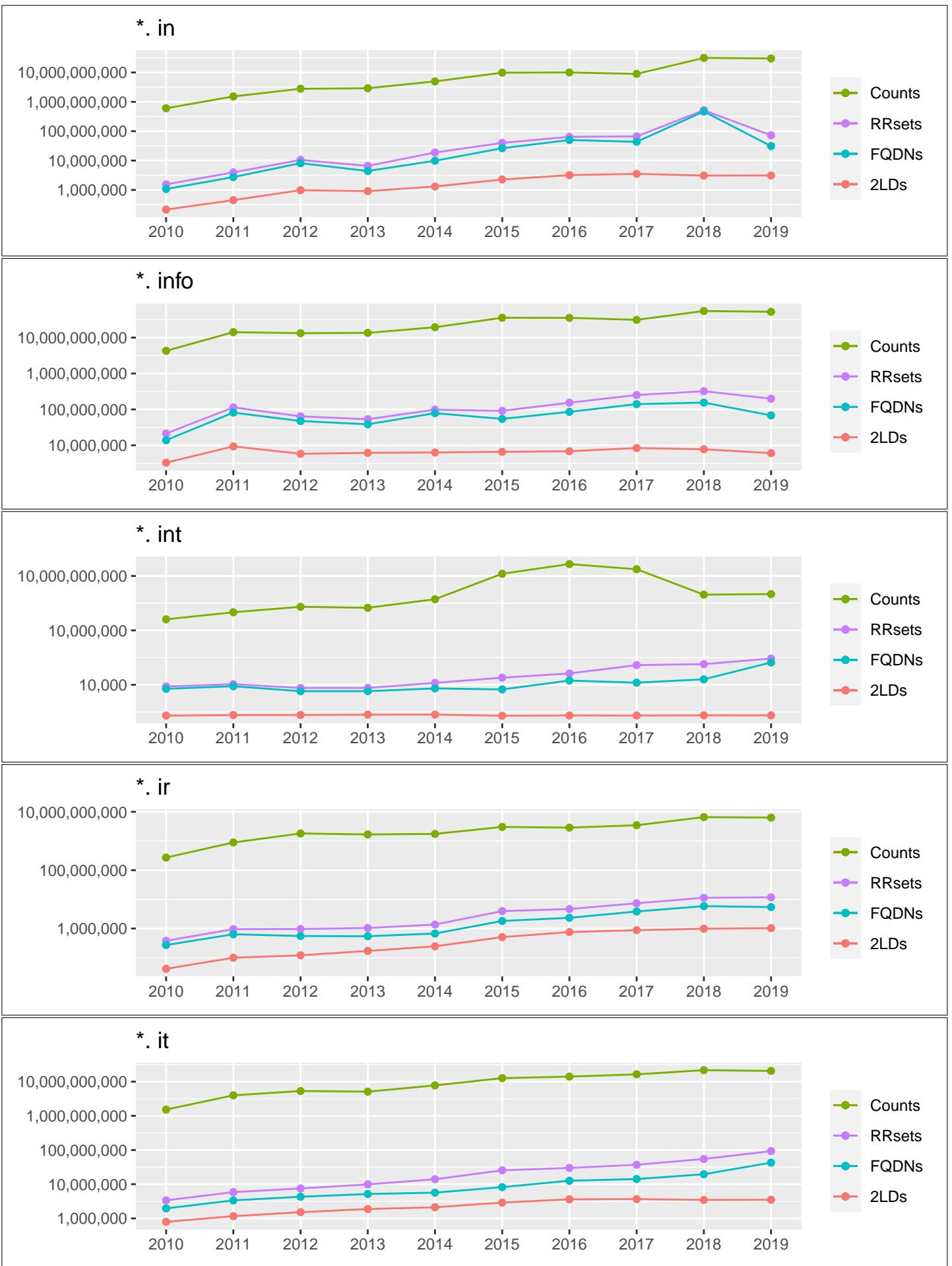


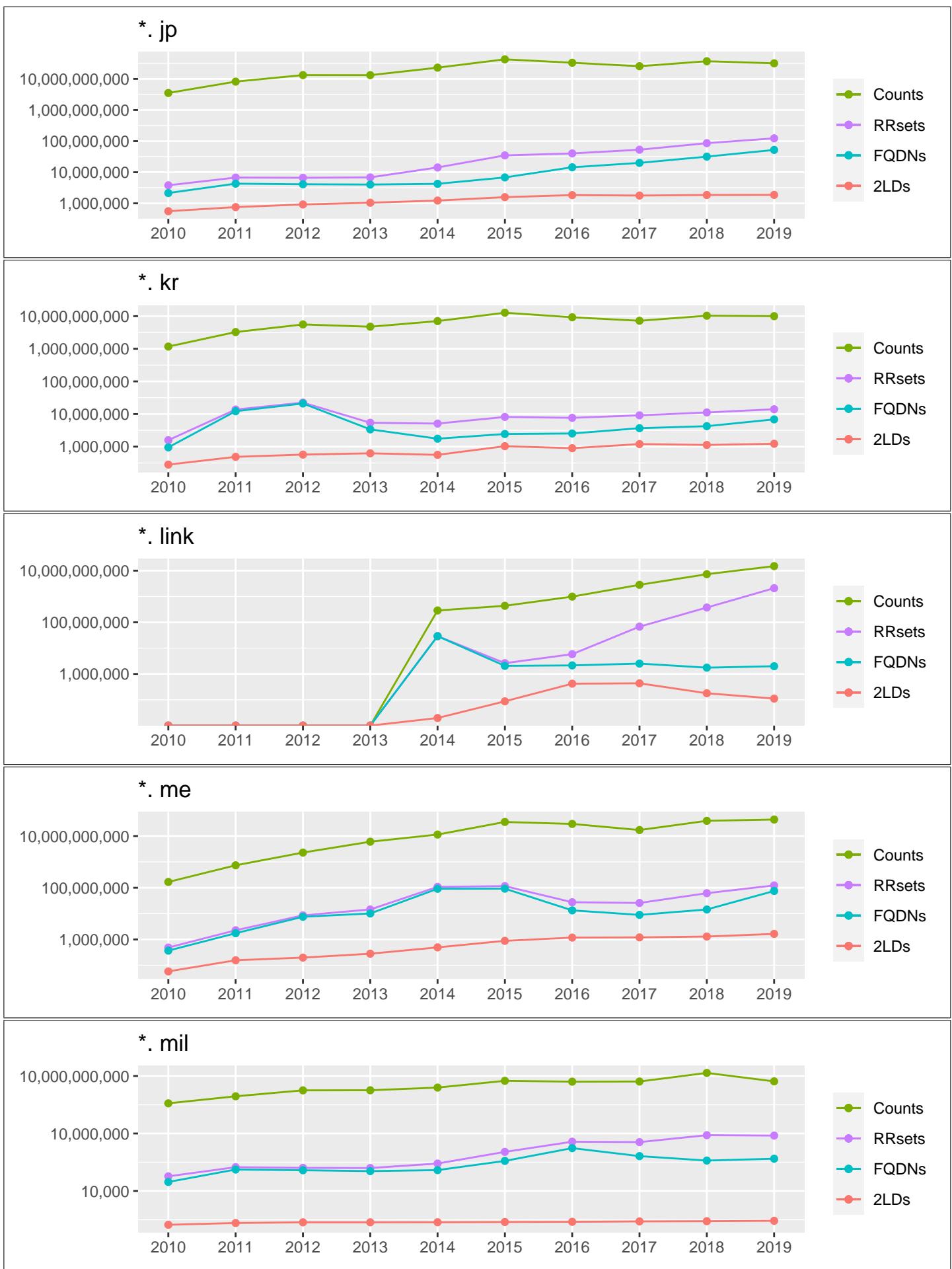


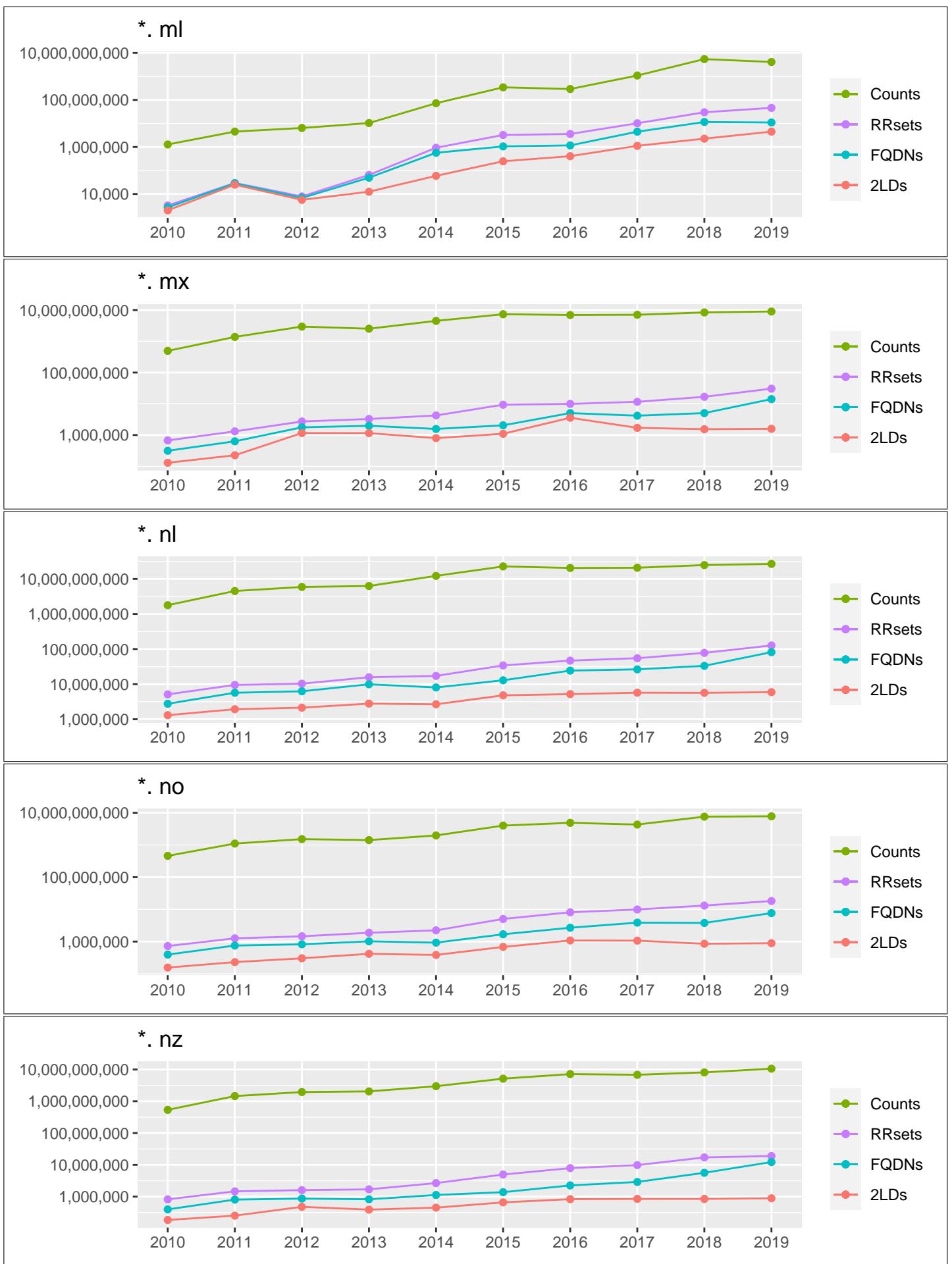


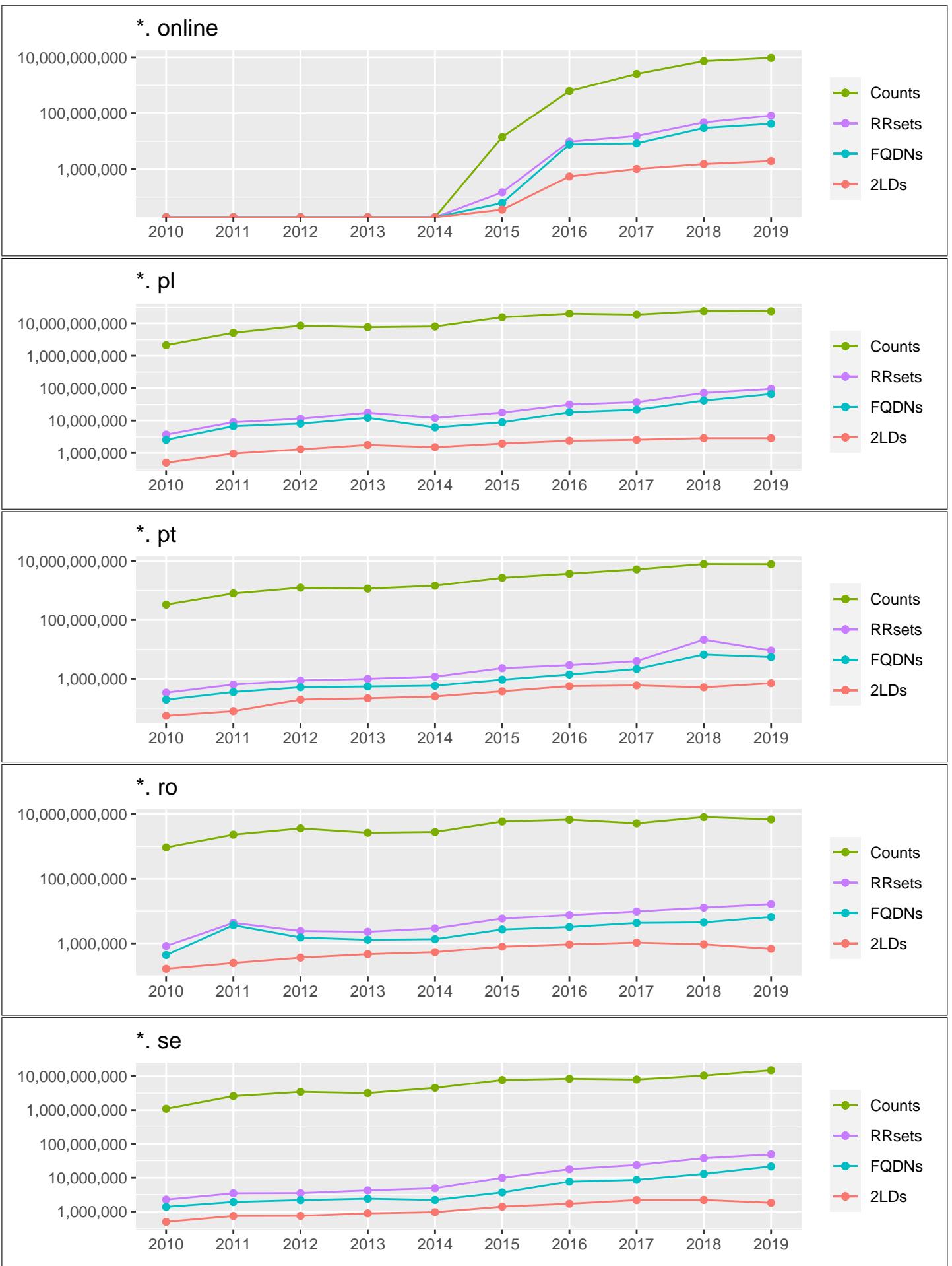


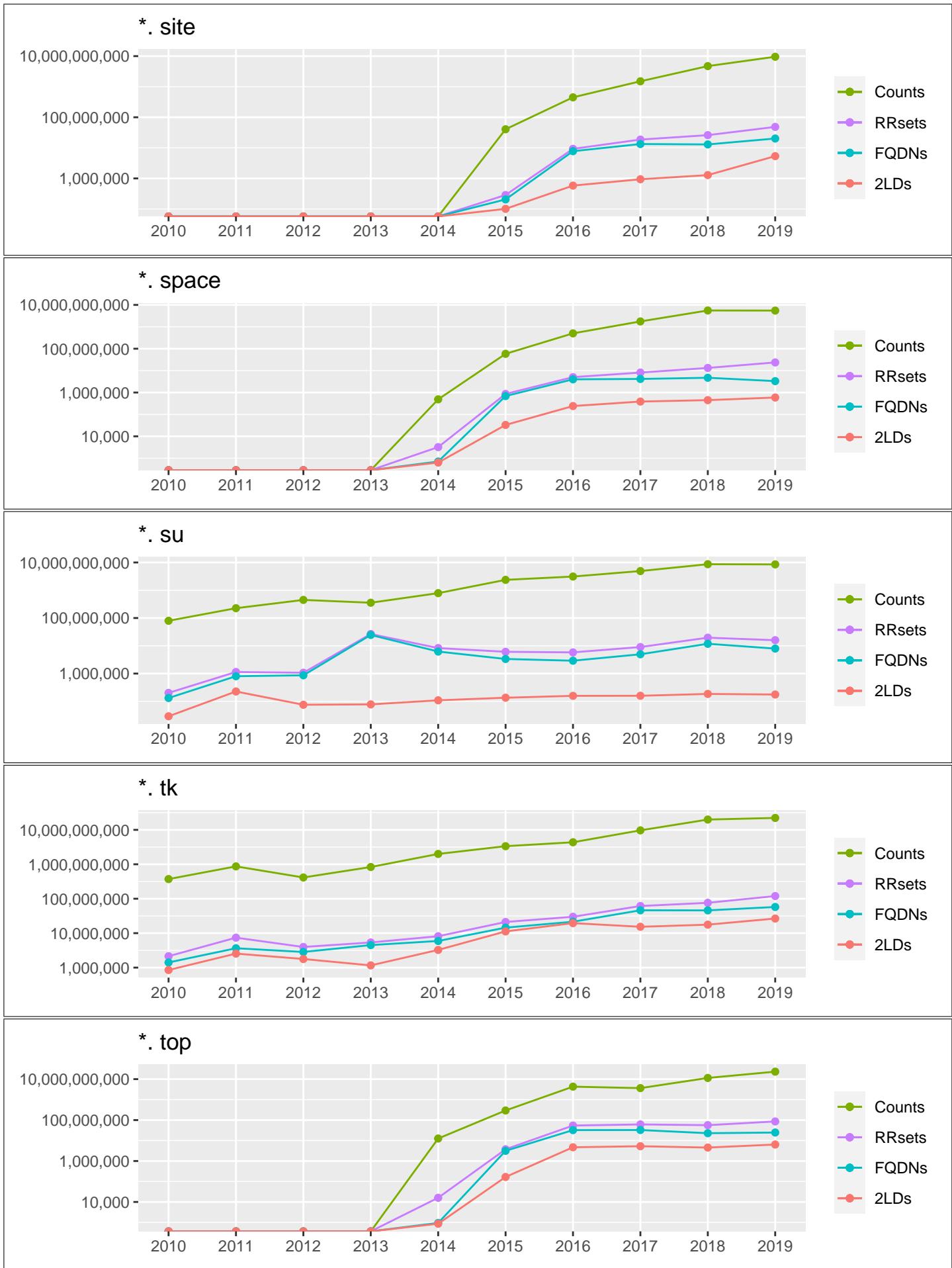


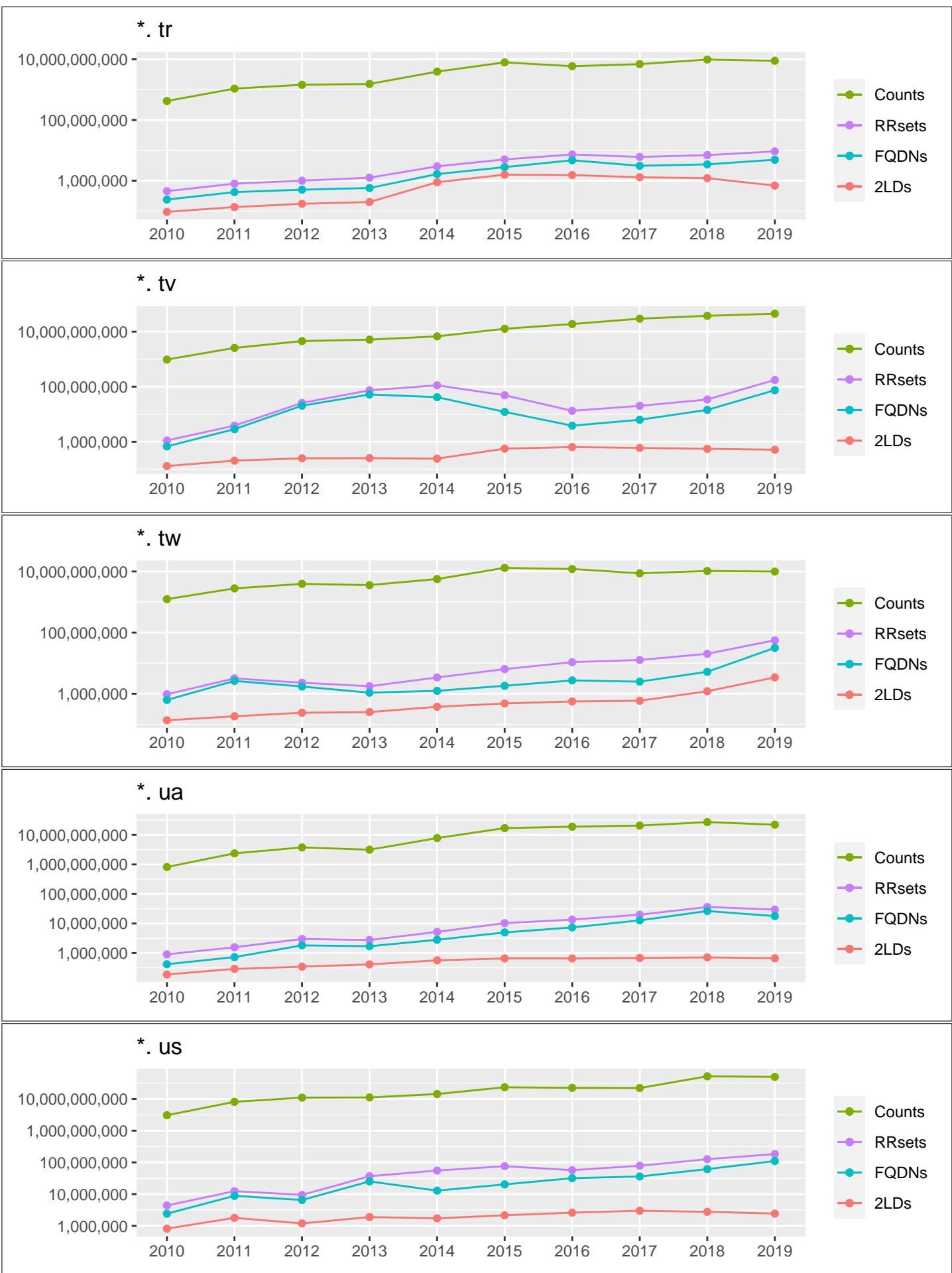


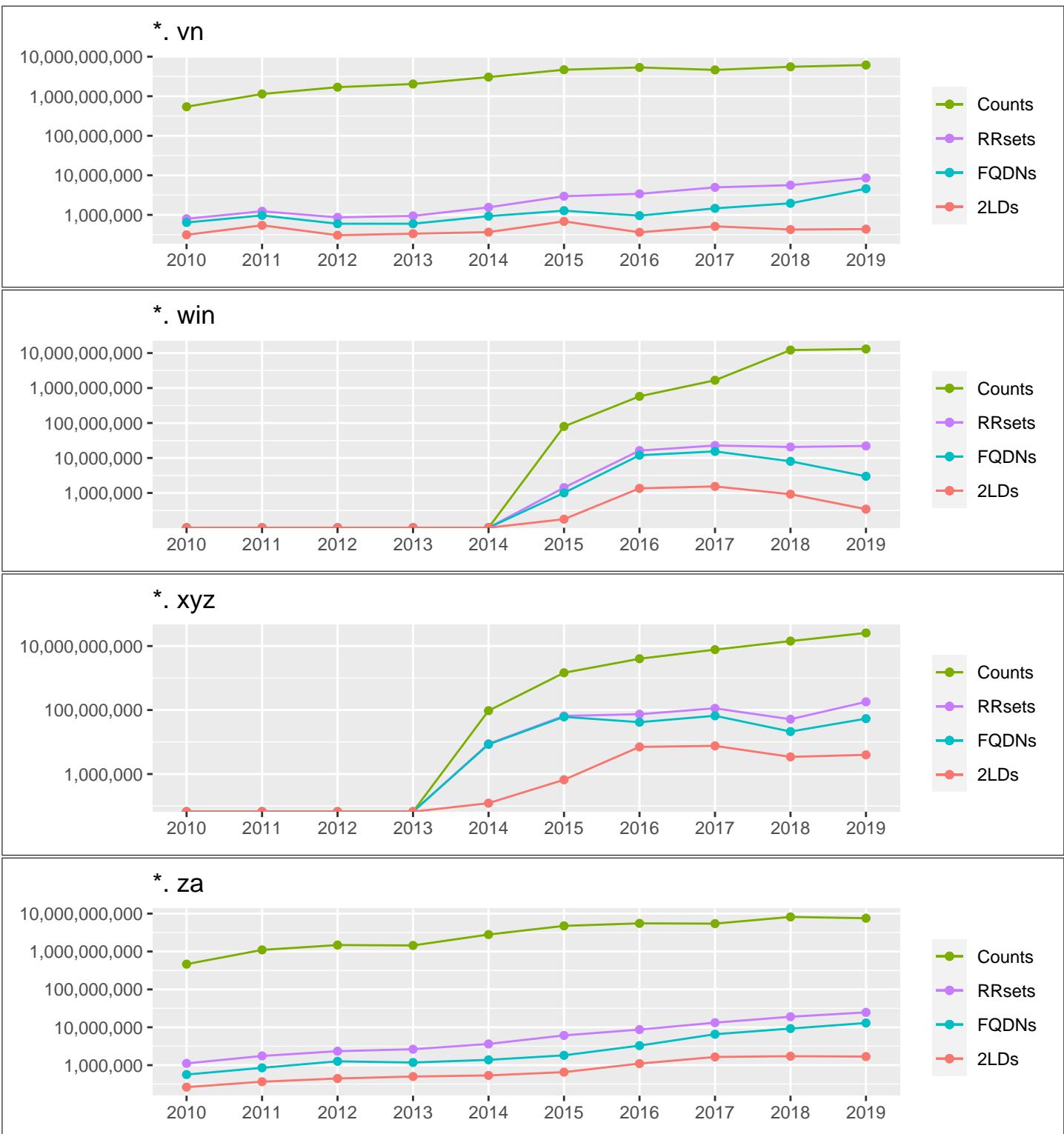








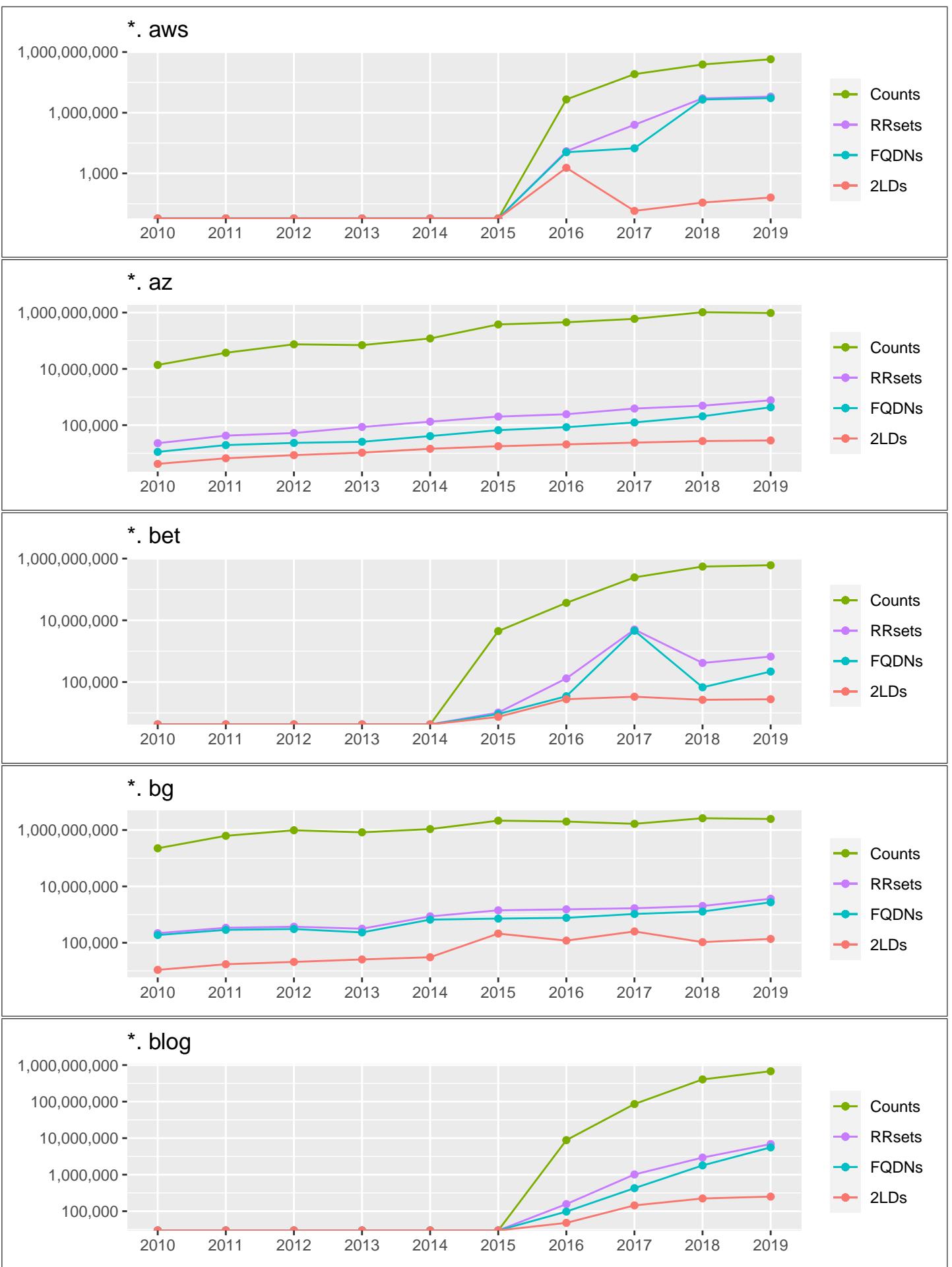


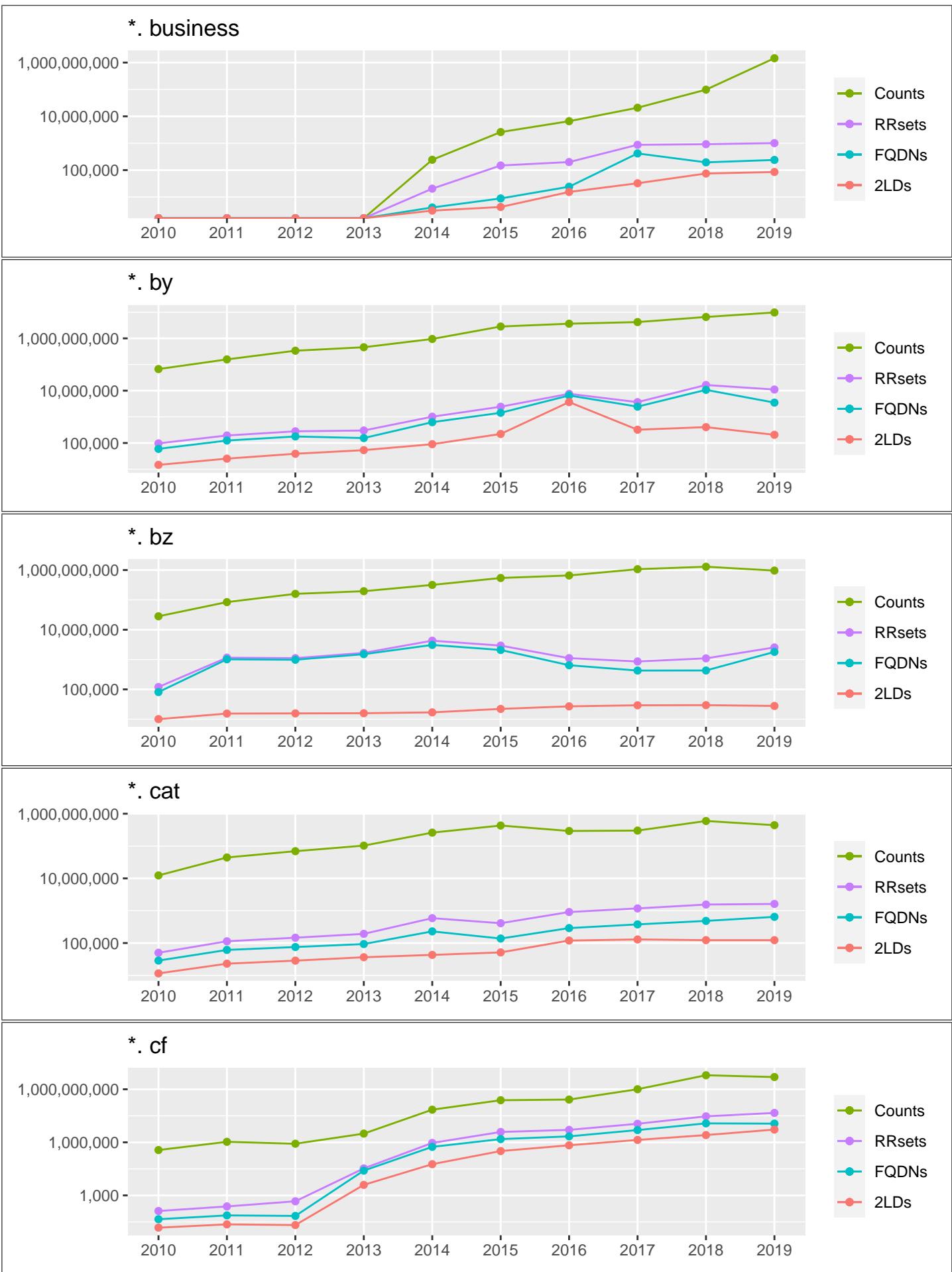


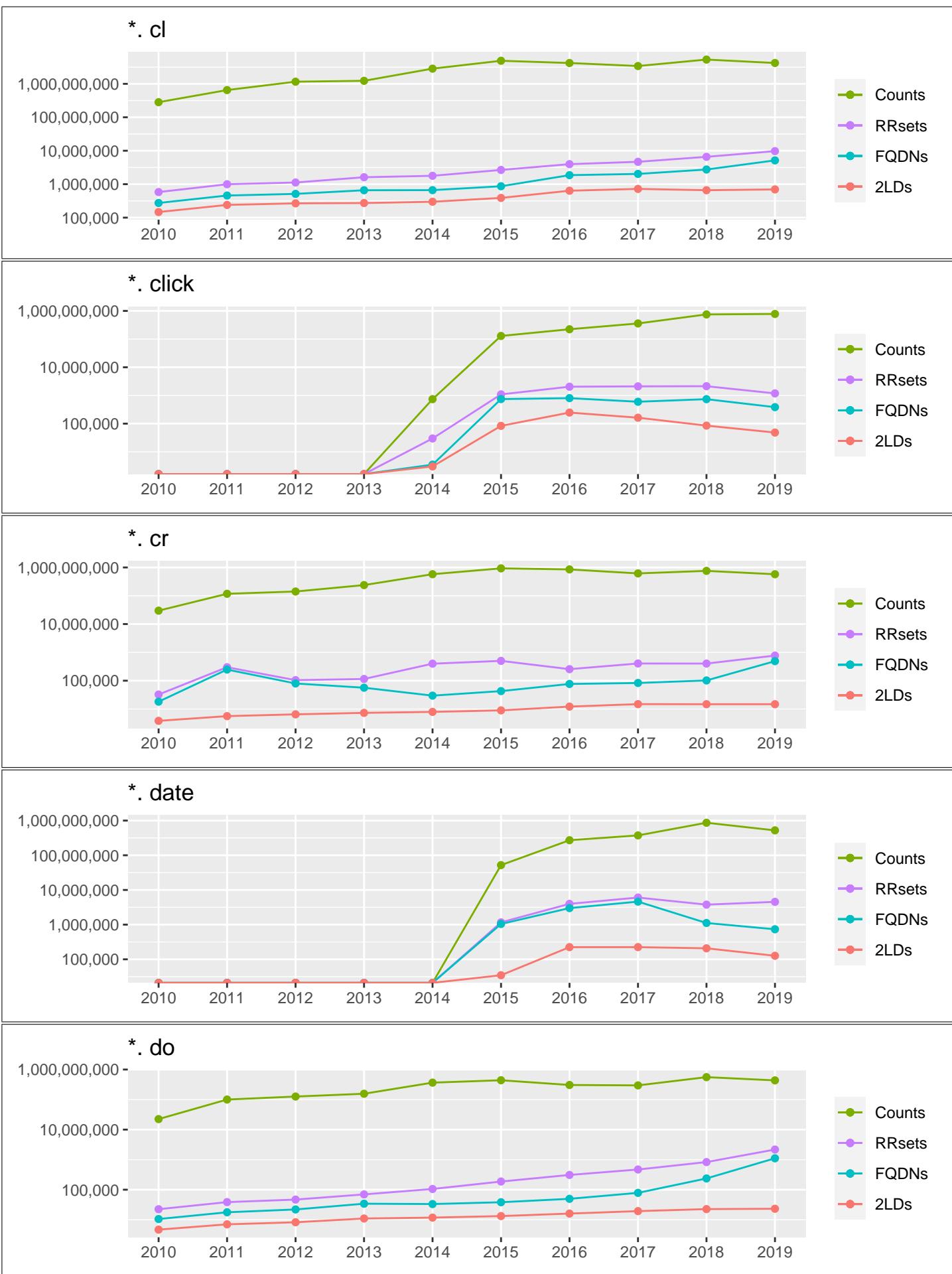
Chapter 5

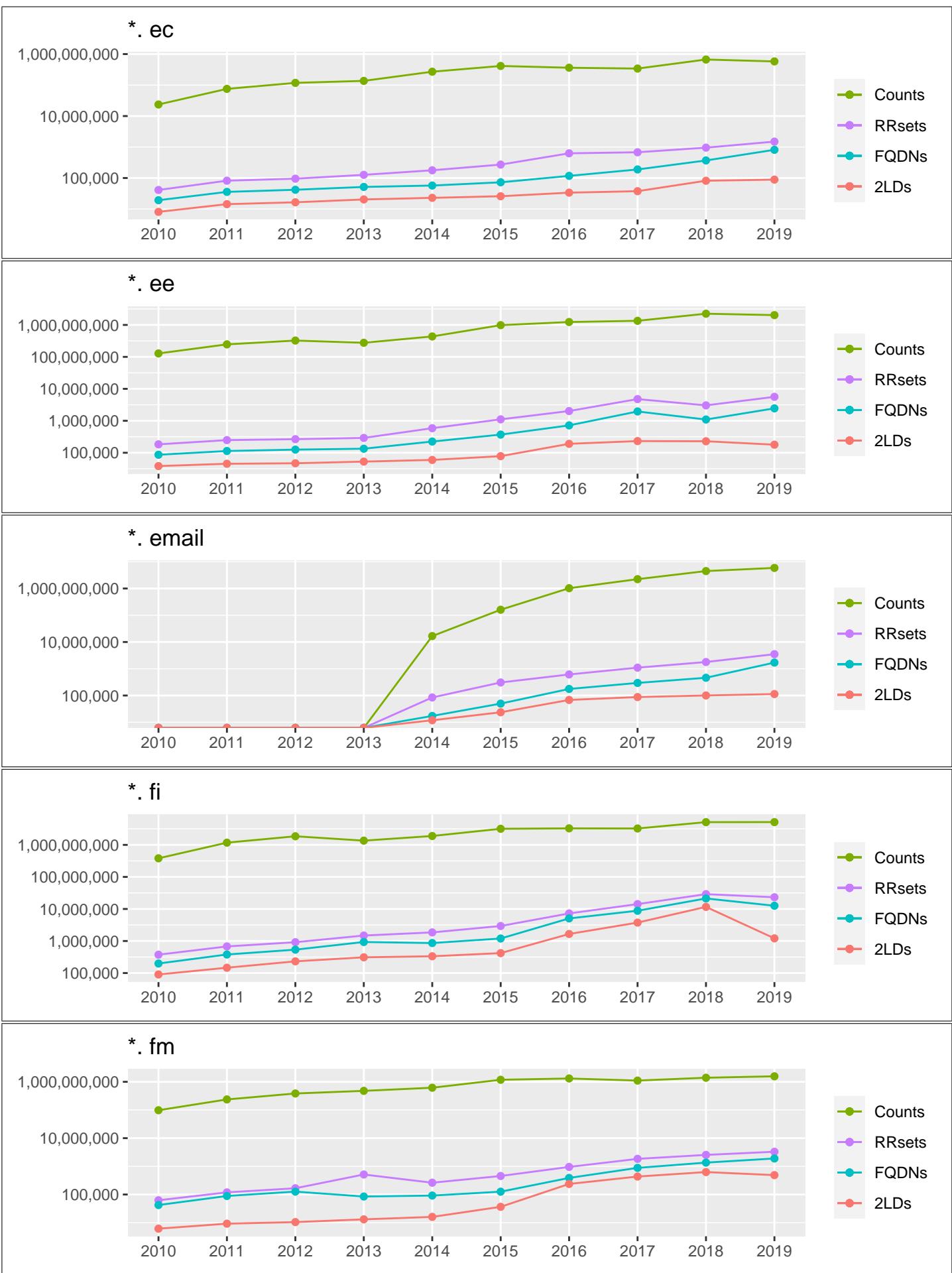
Billions

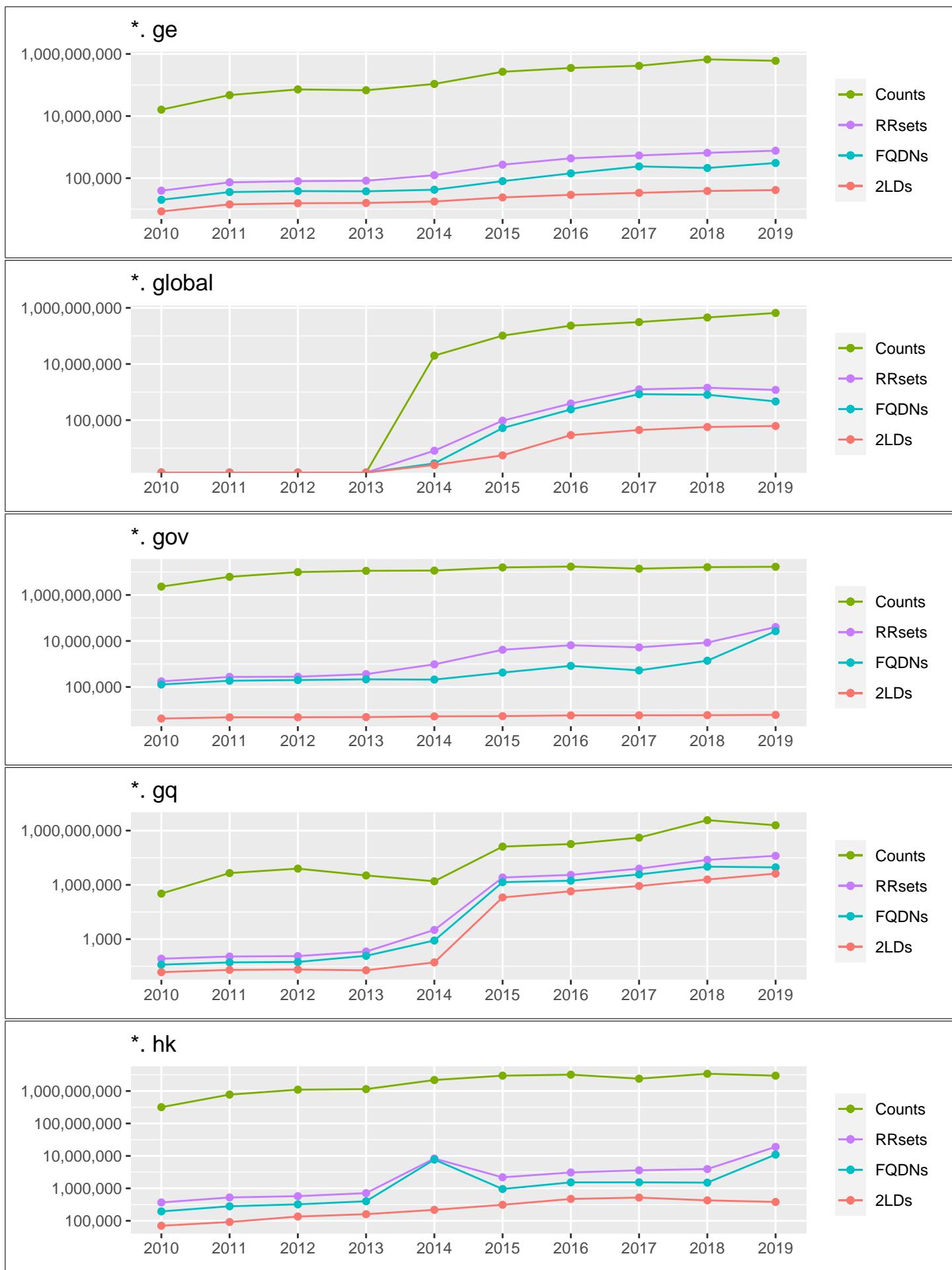


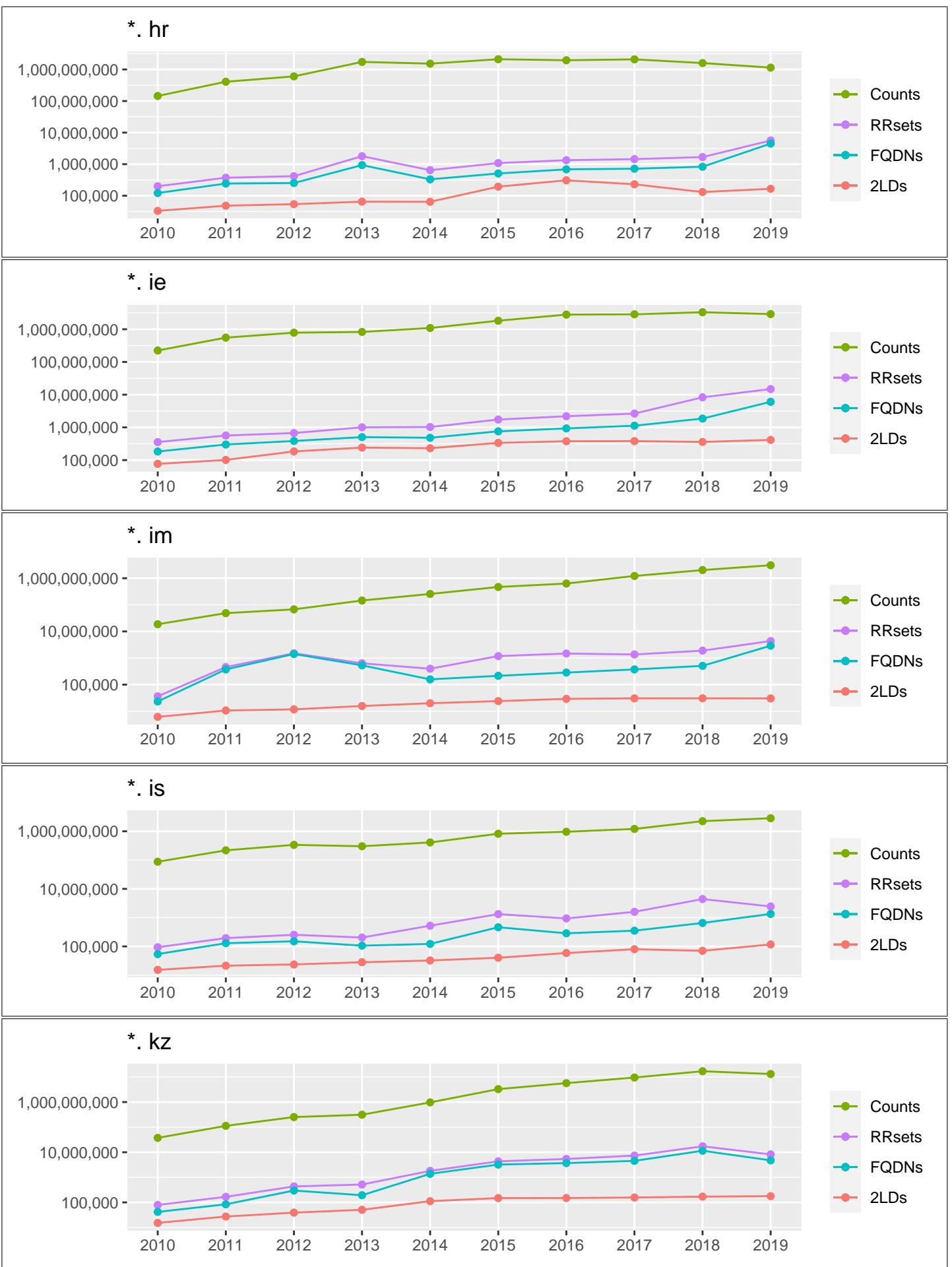


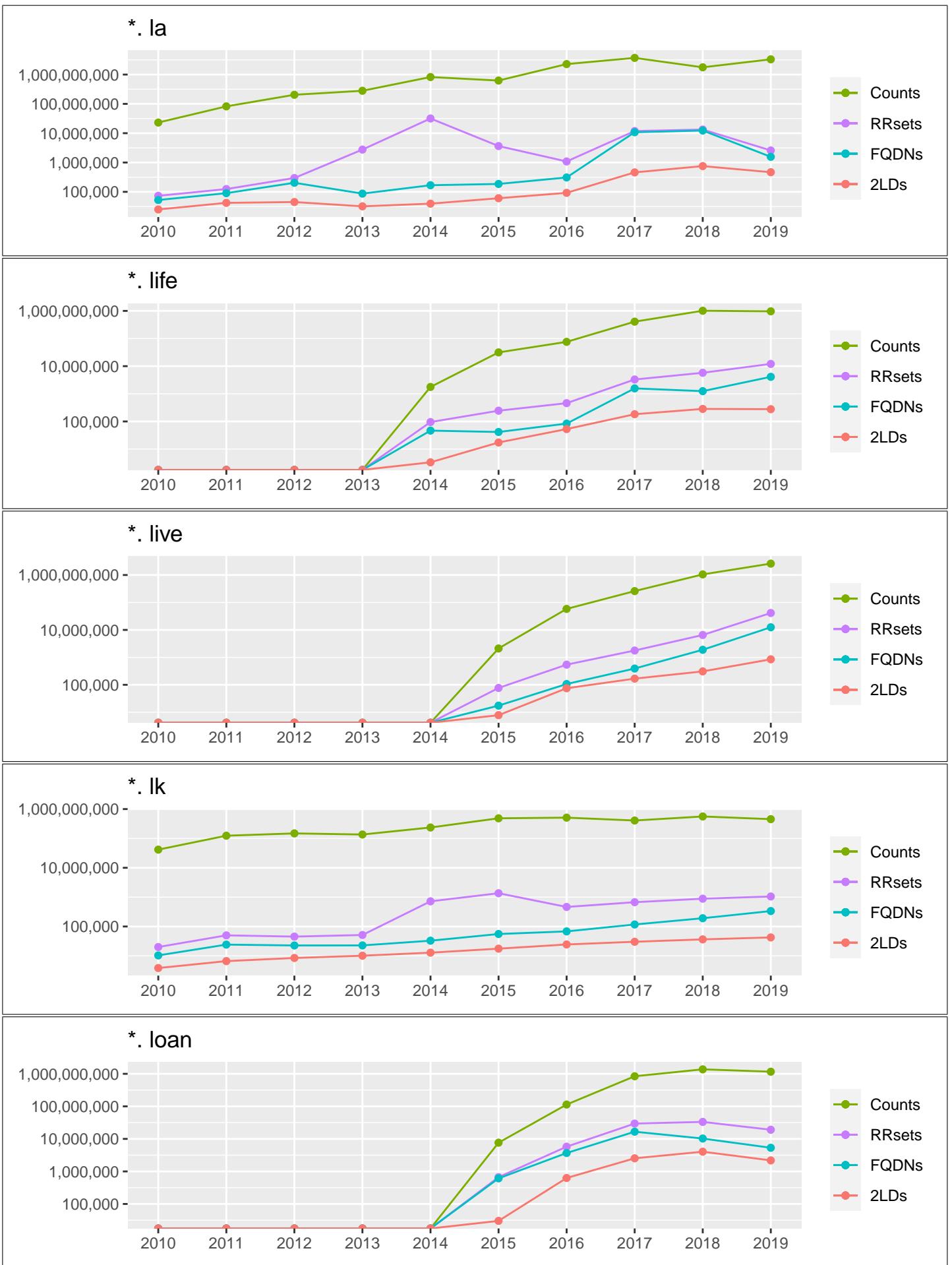




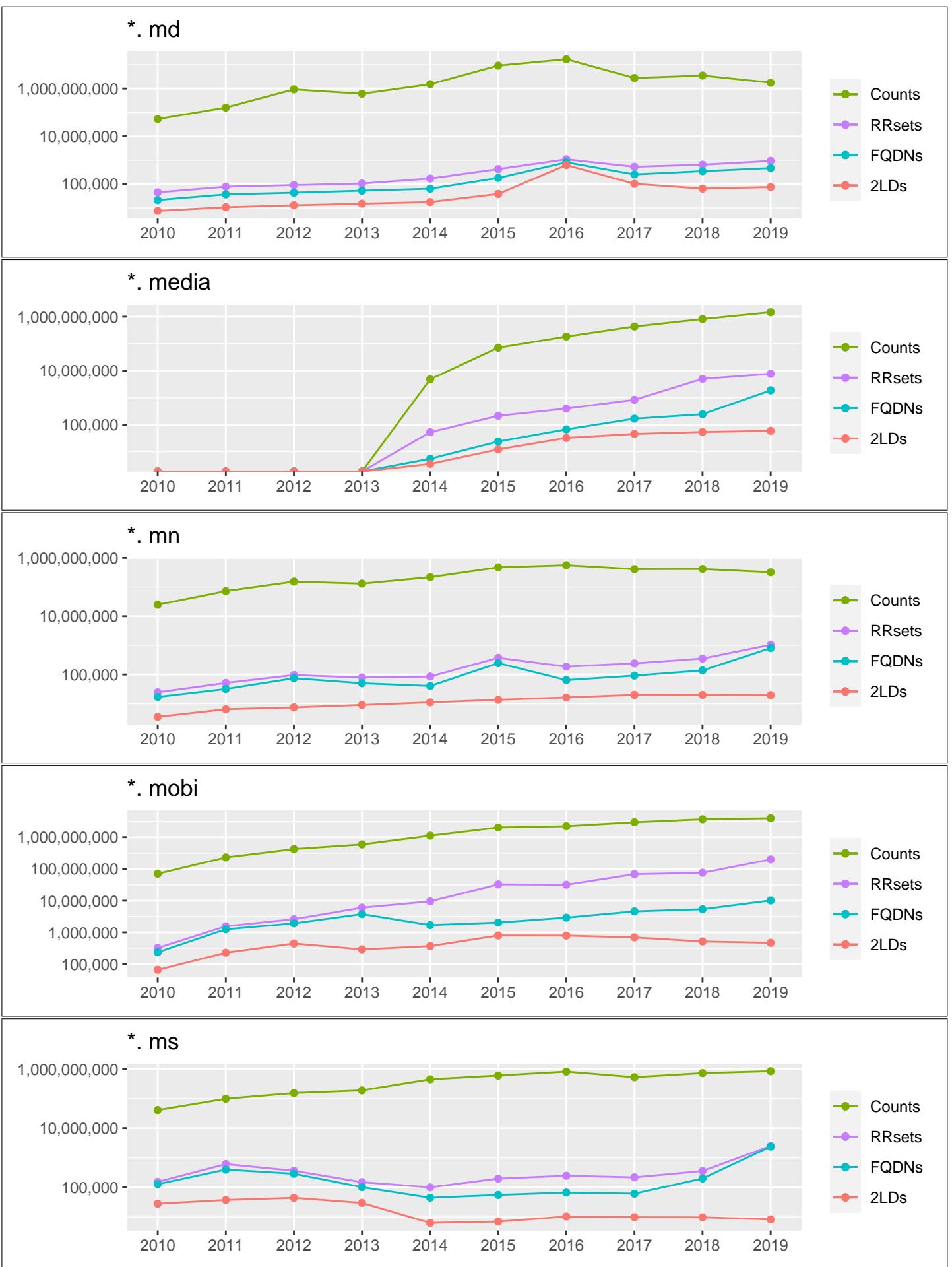


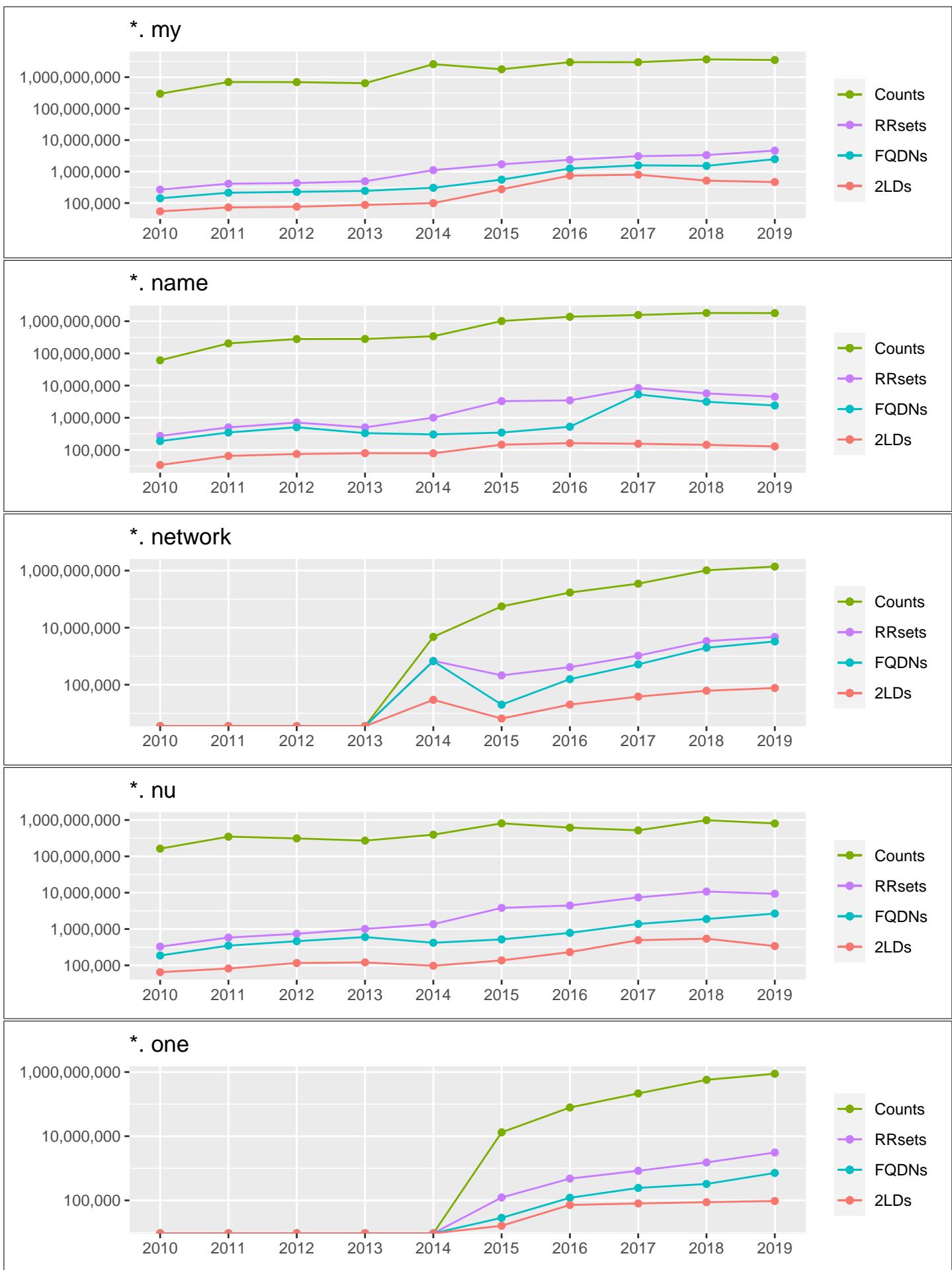


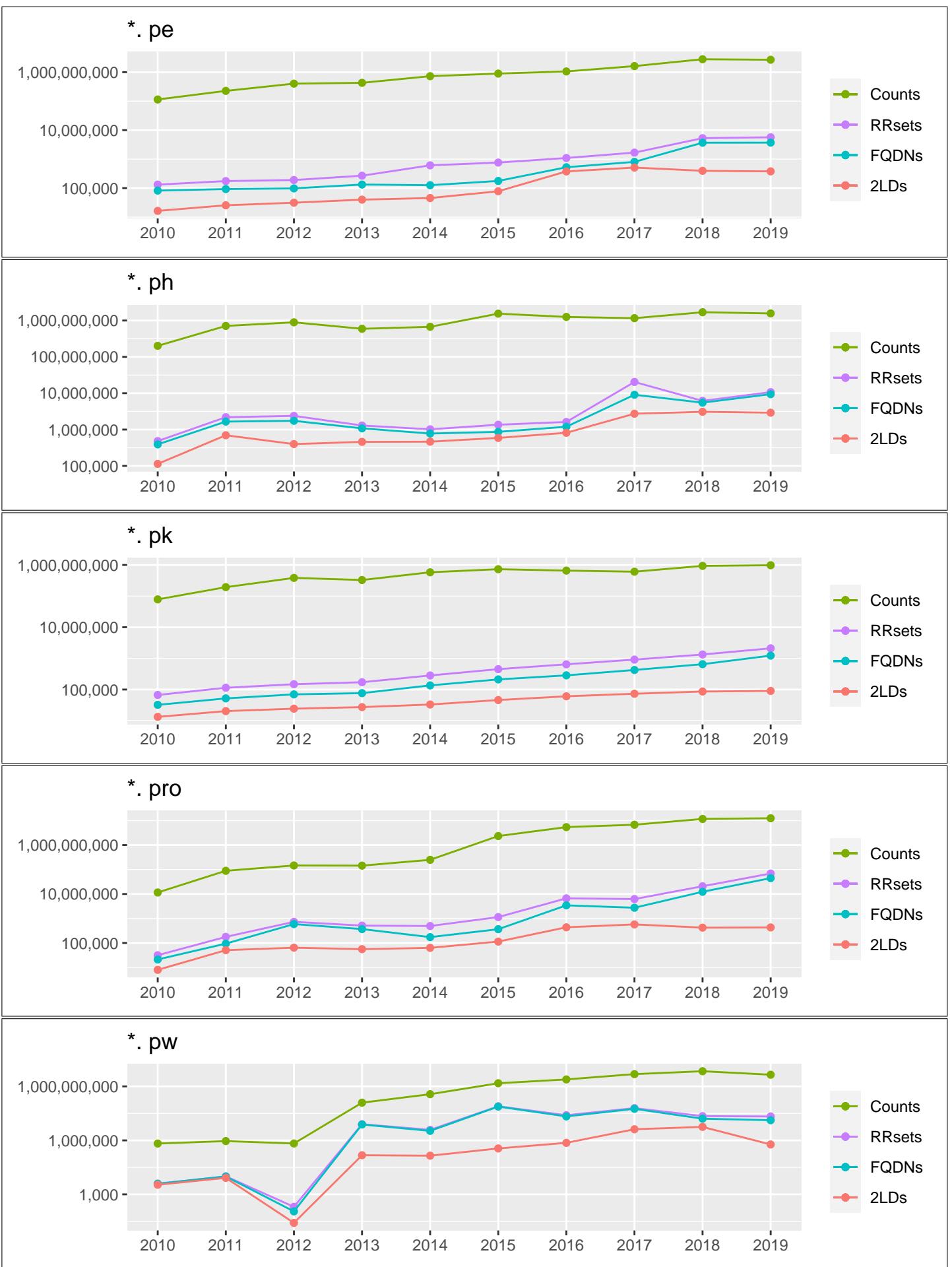




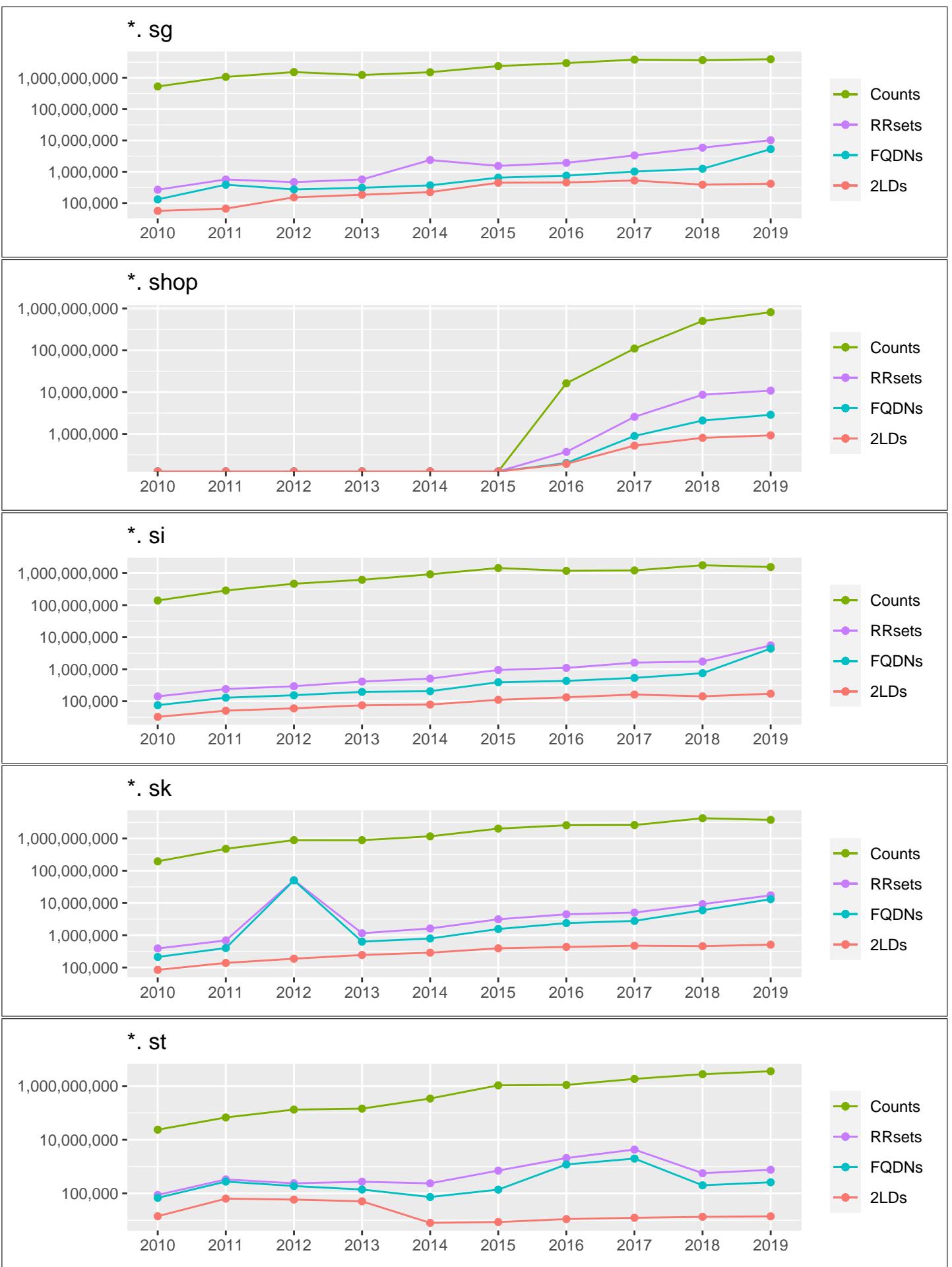


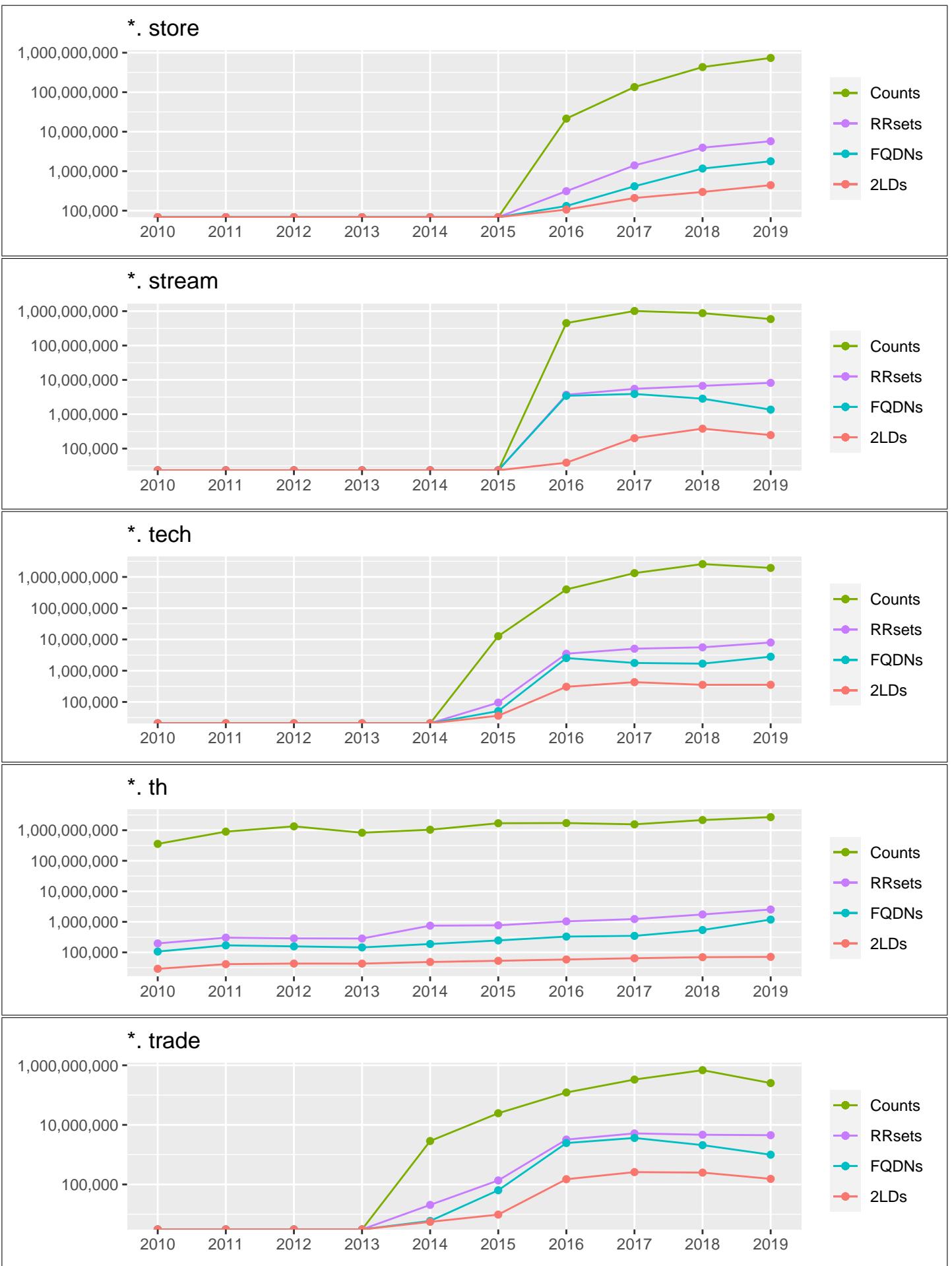


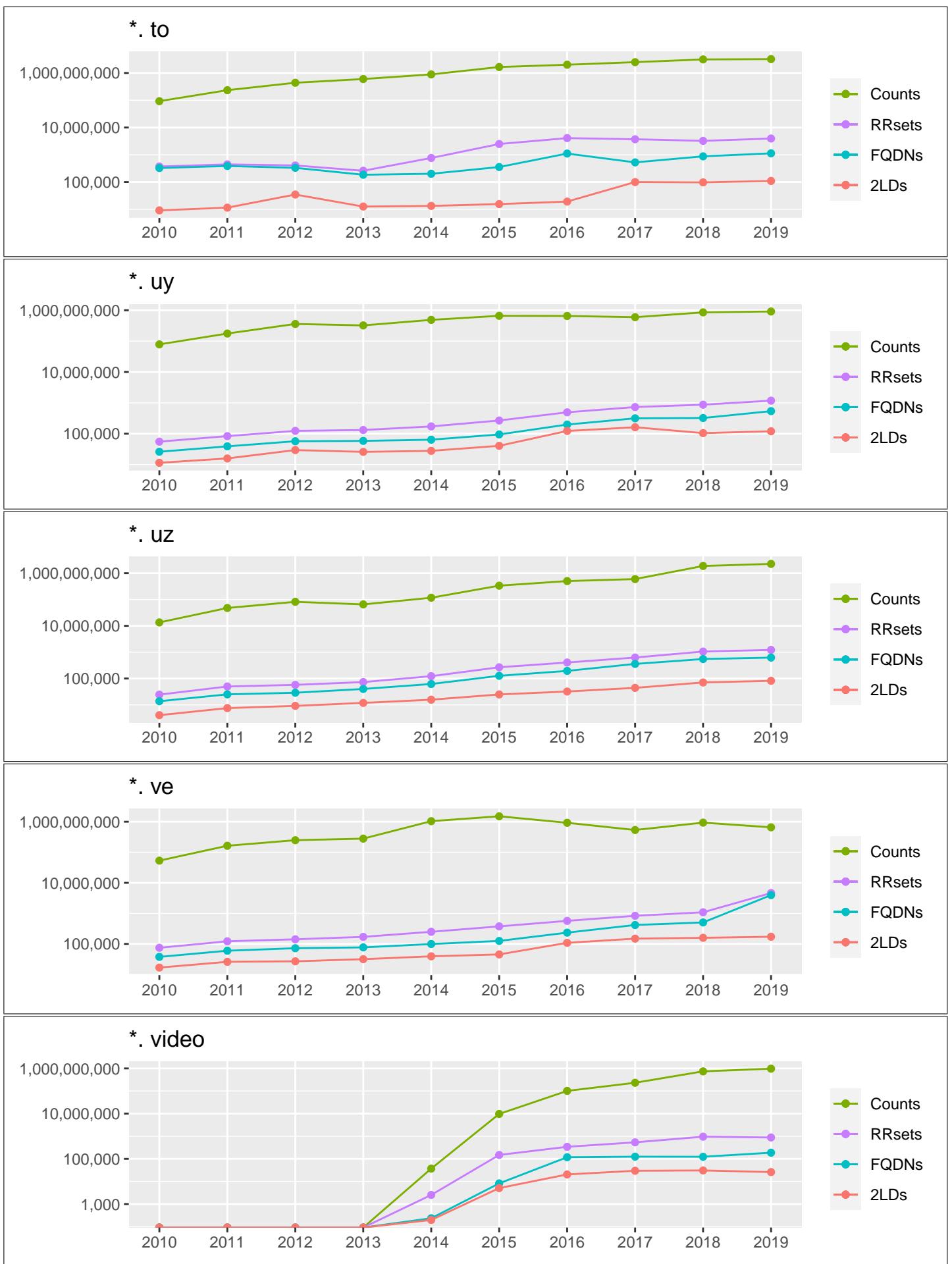


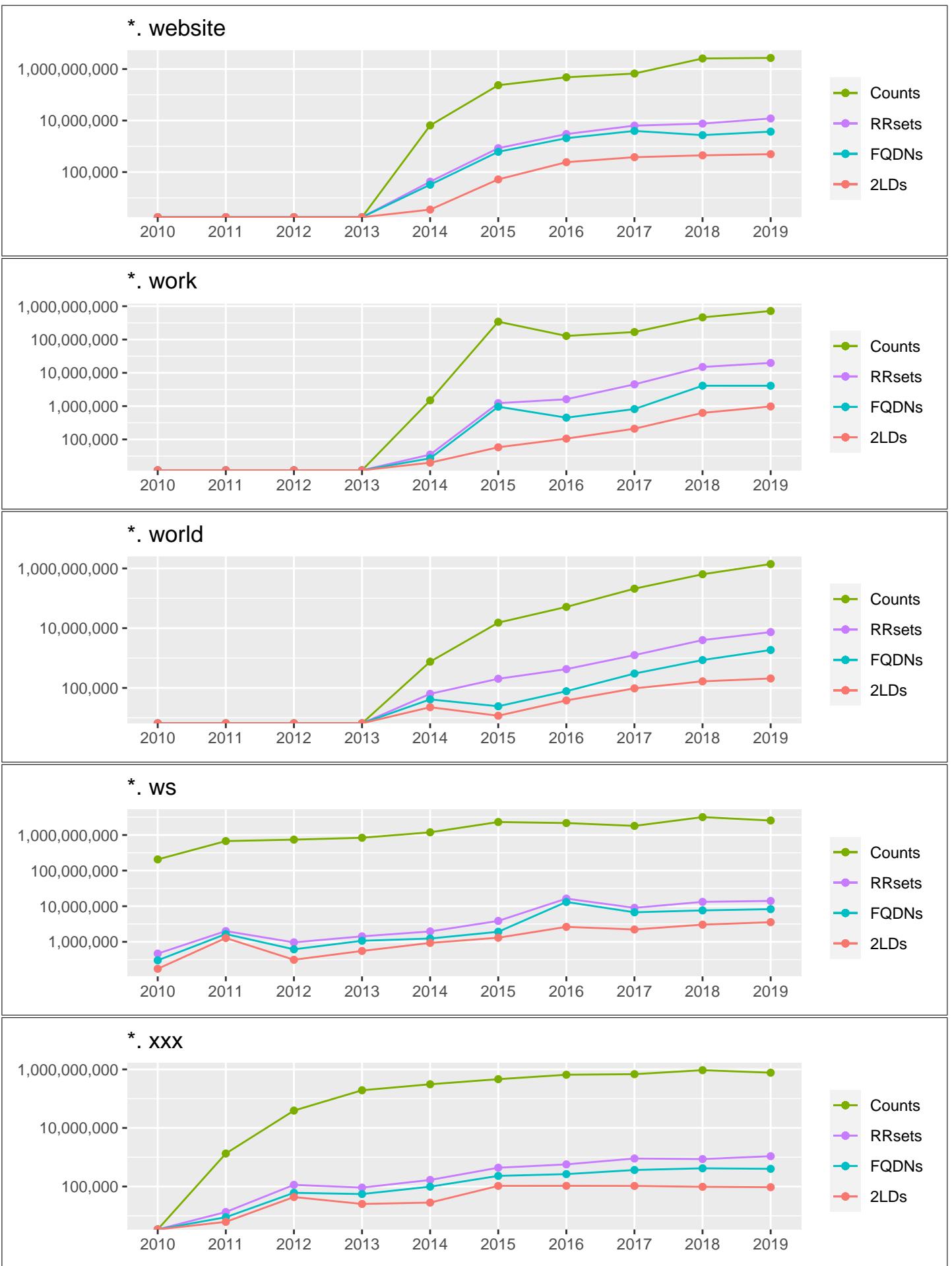


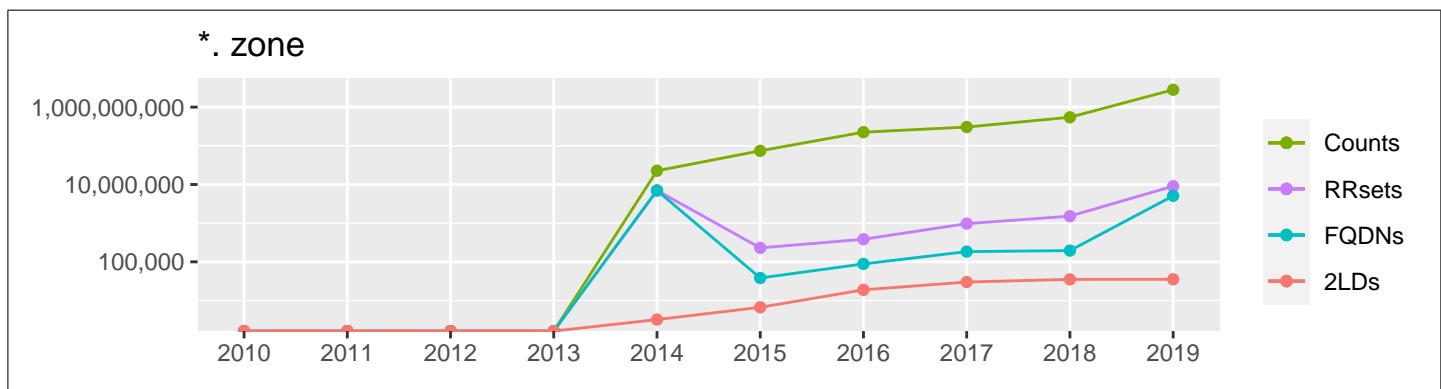






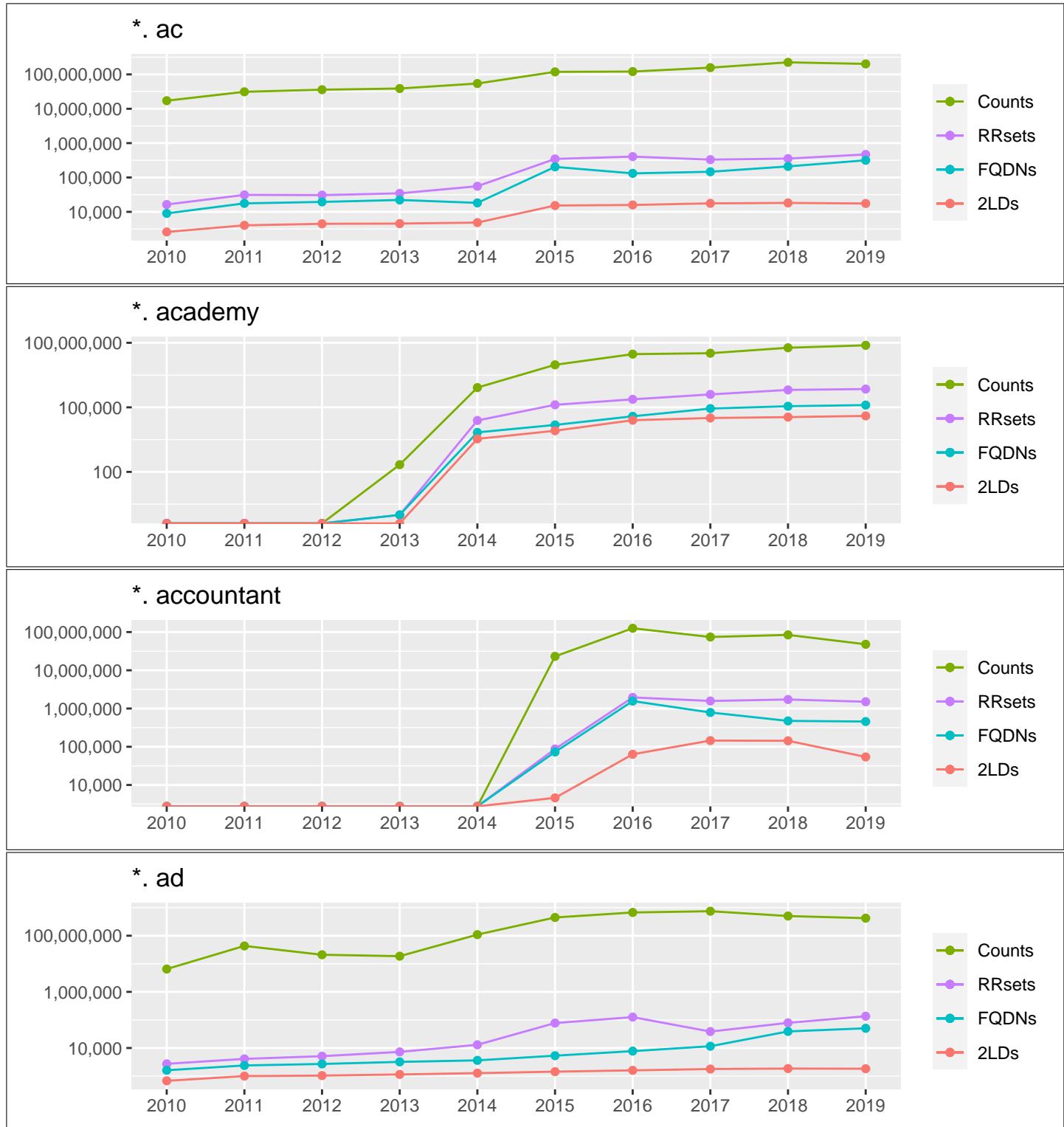






Chapter 6

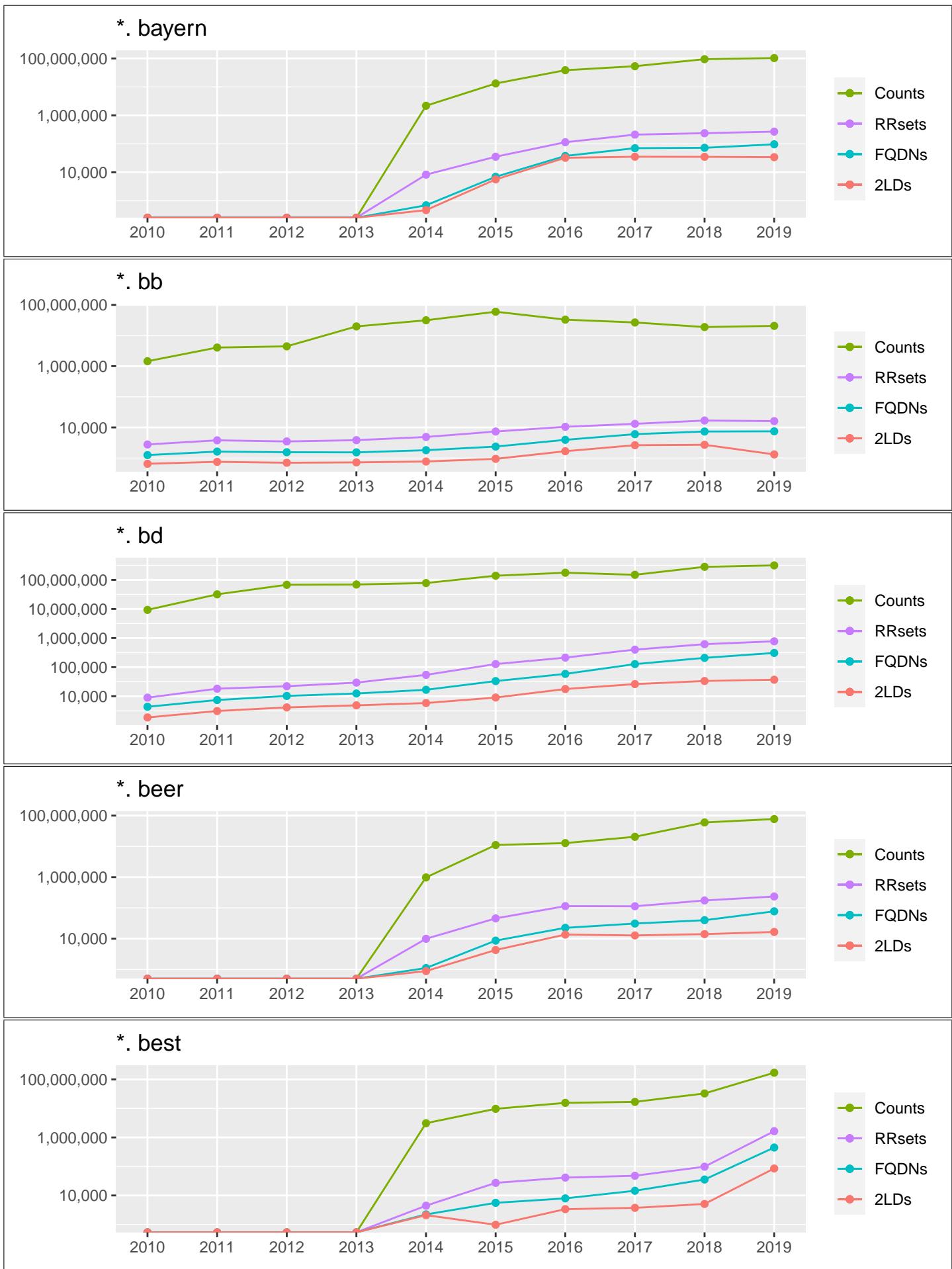
Hundreds of Millions

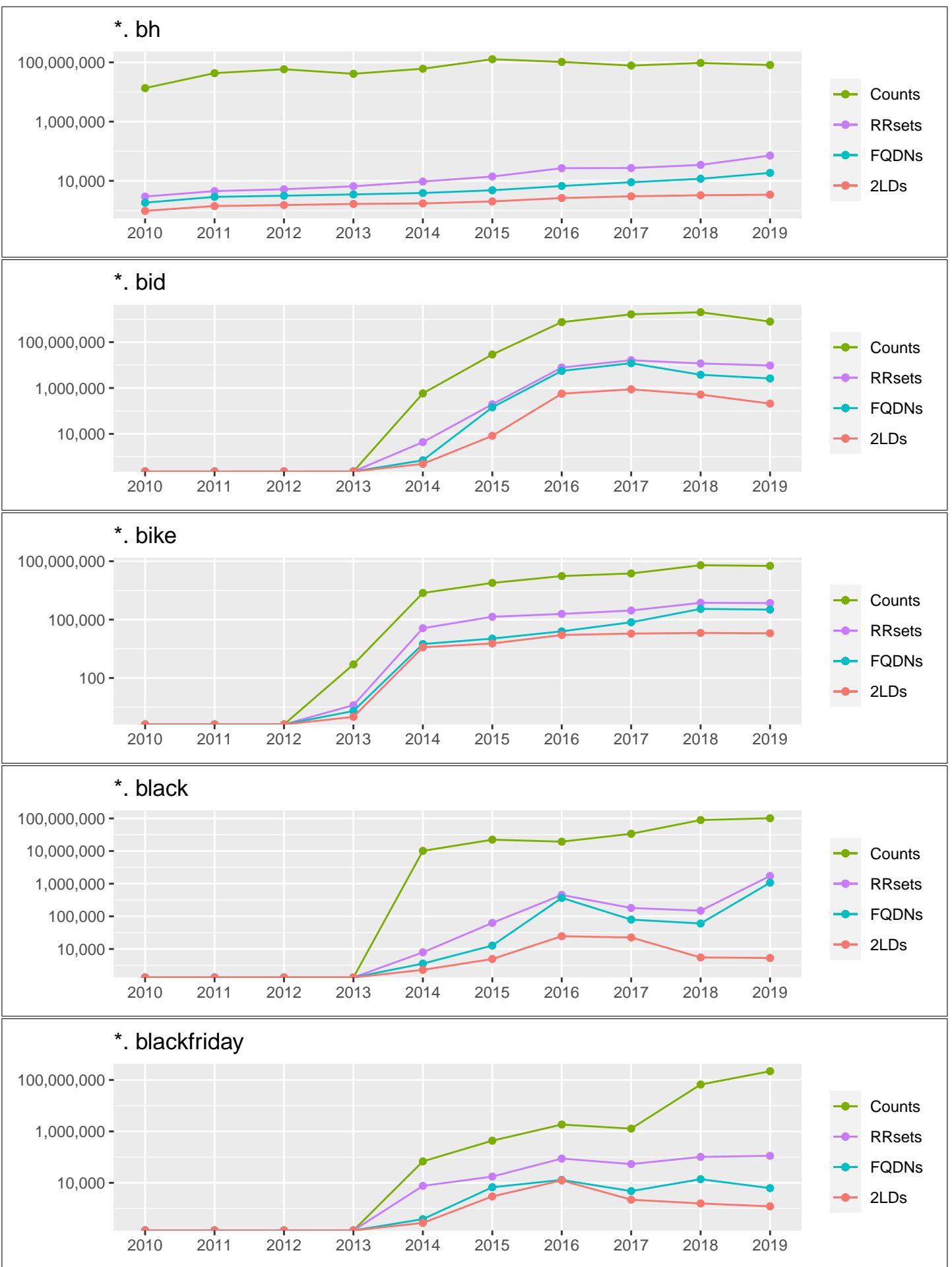






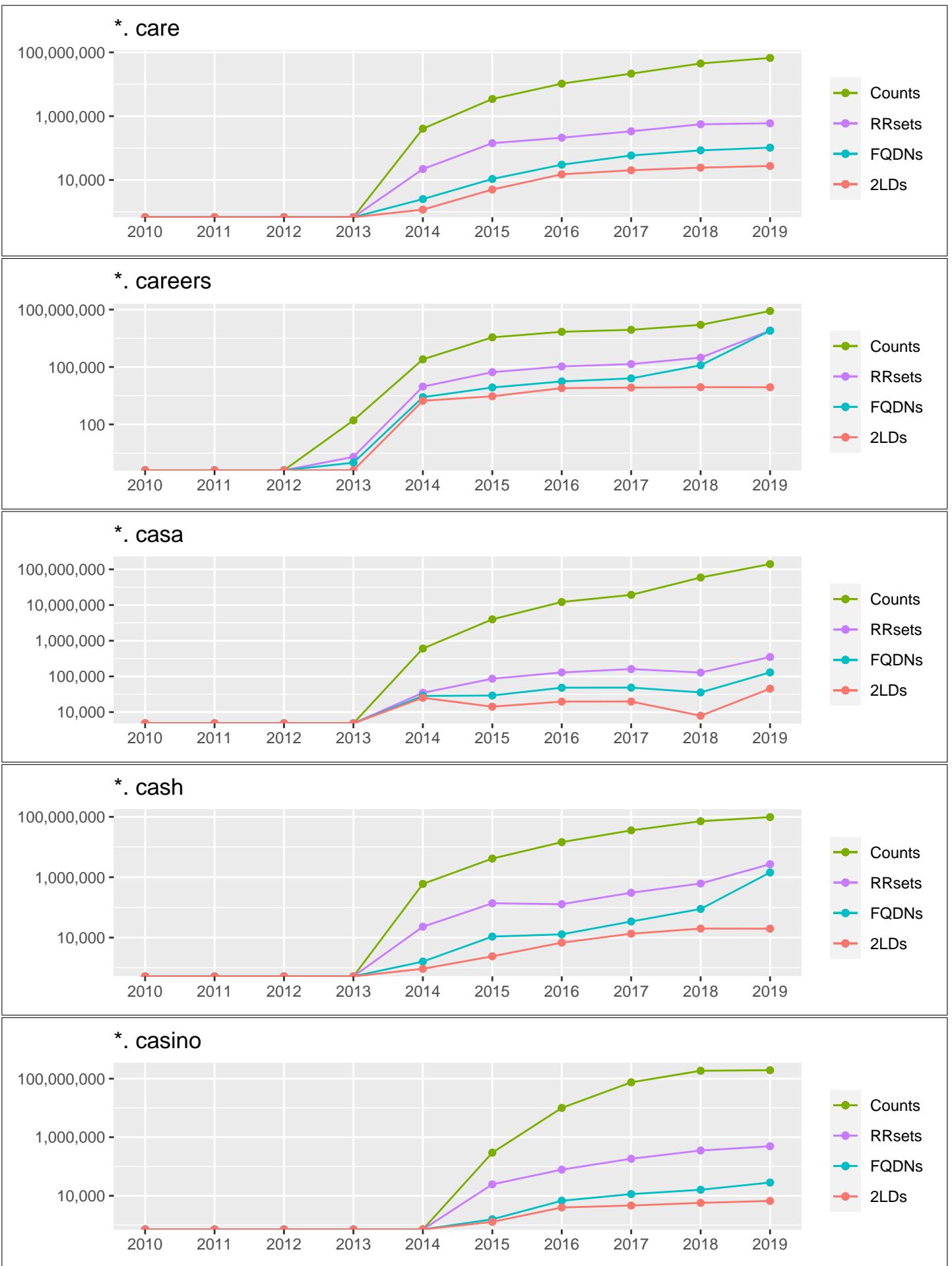


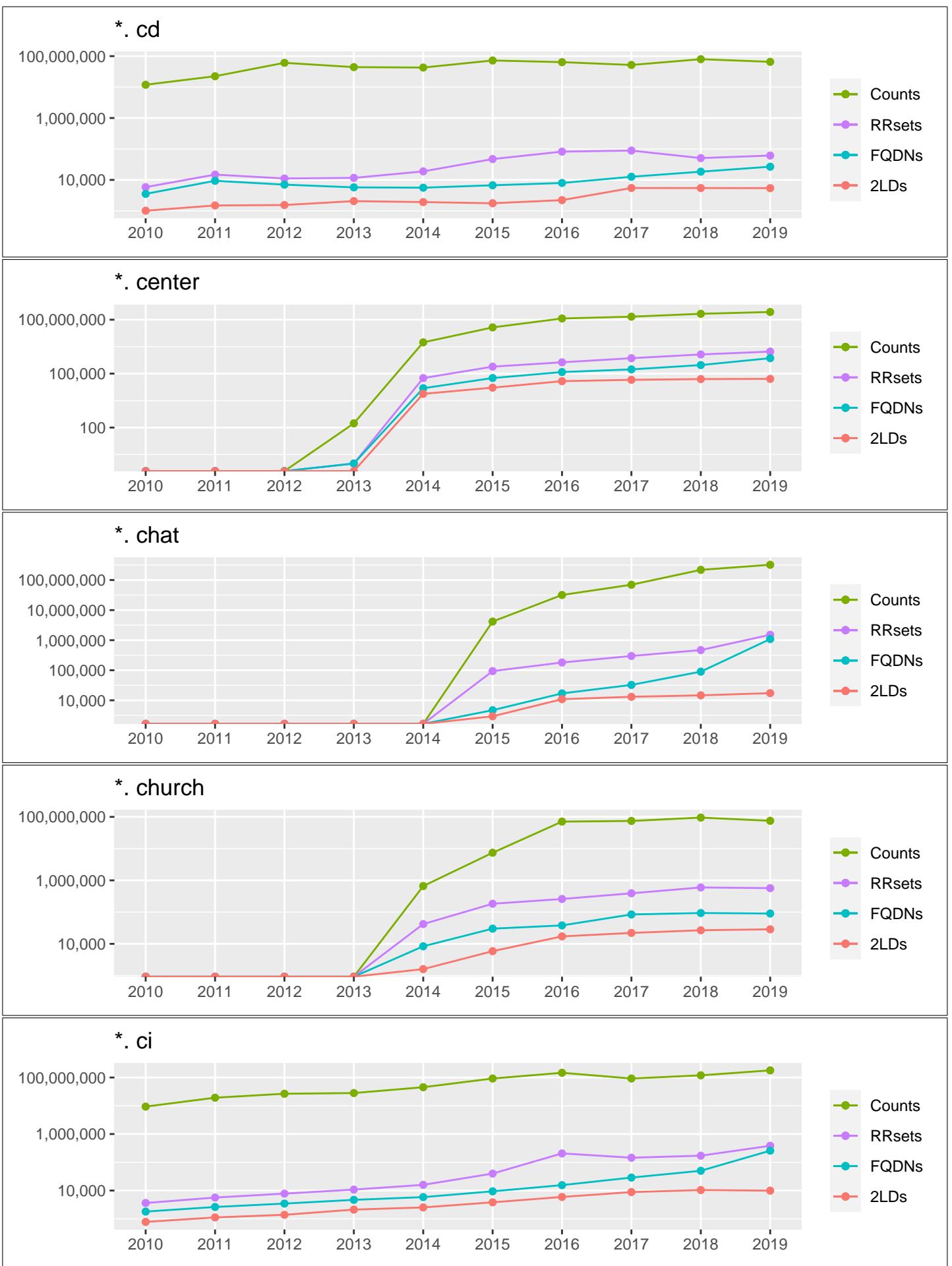




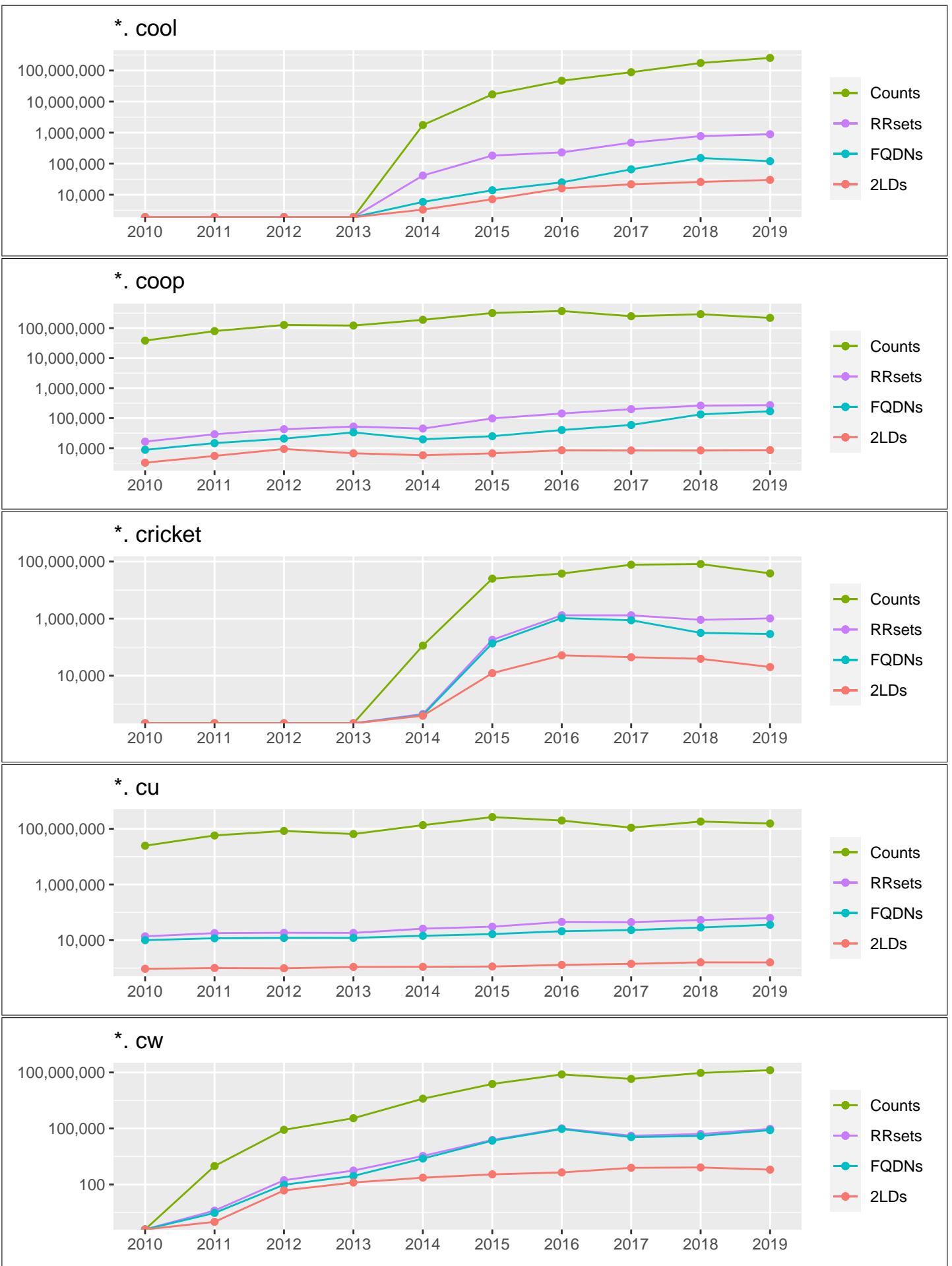






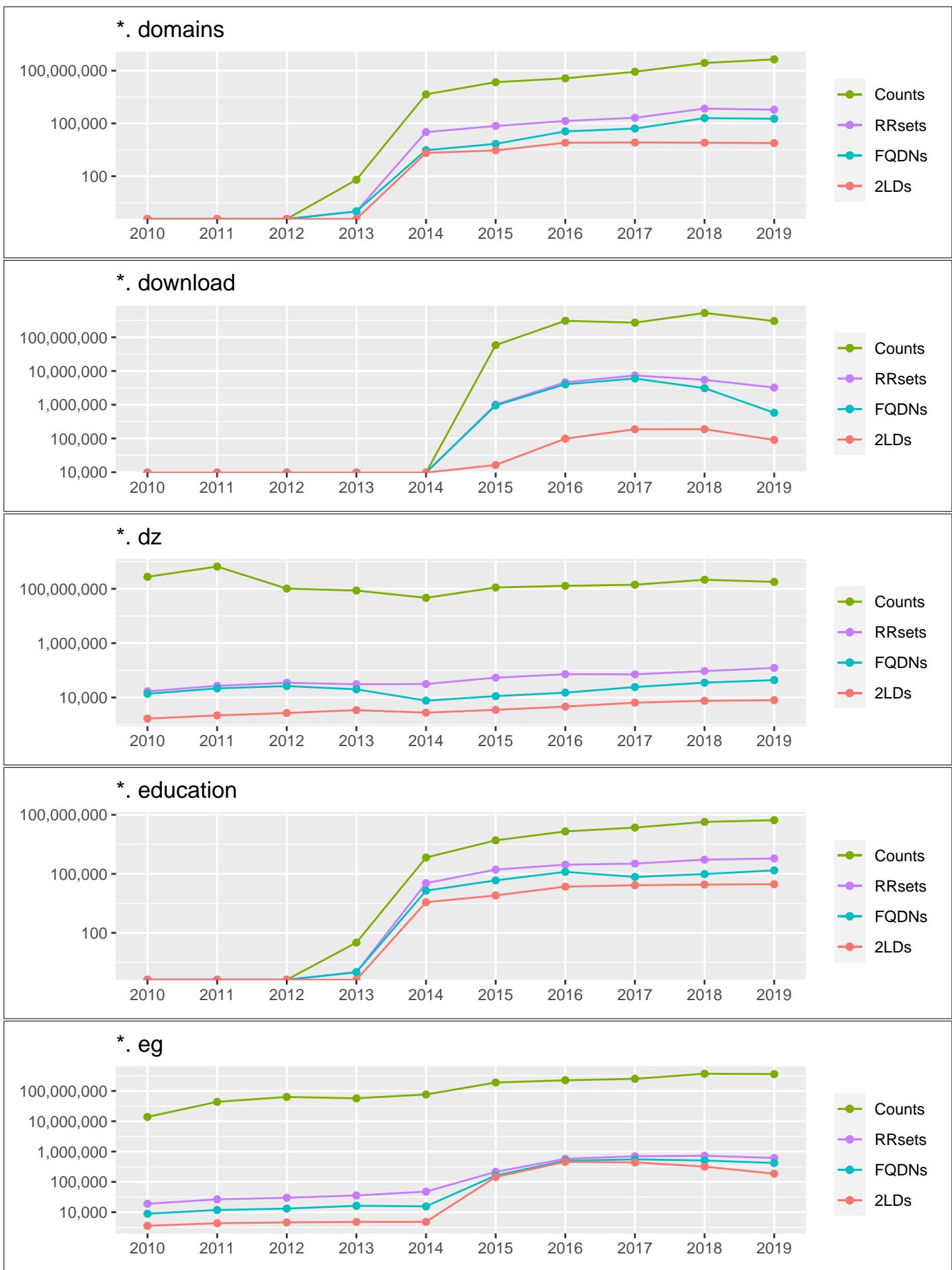


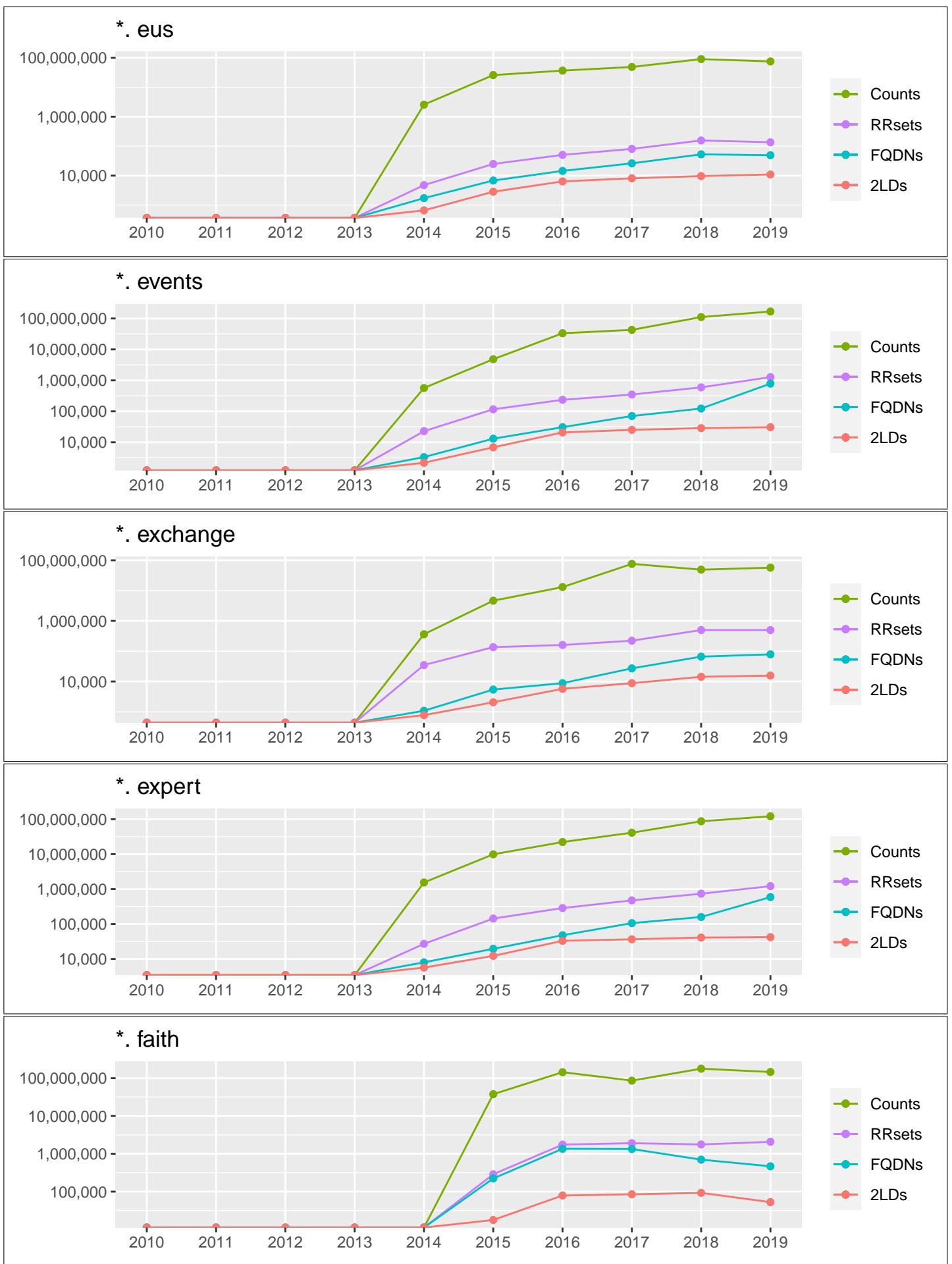


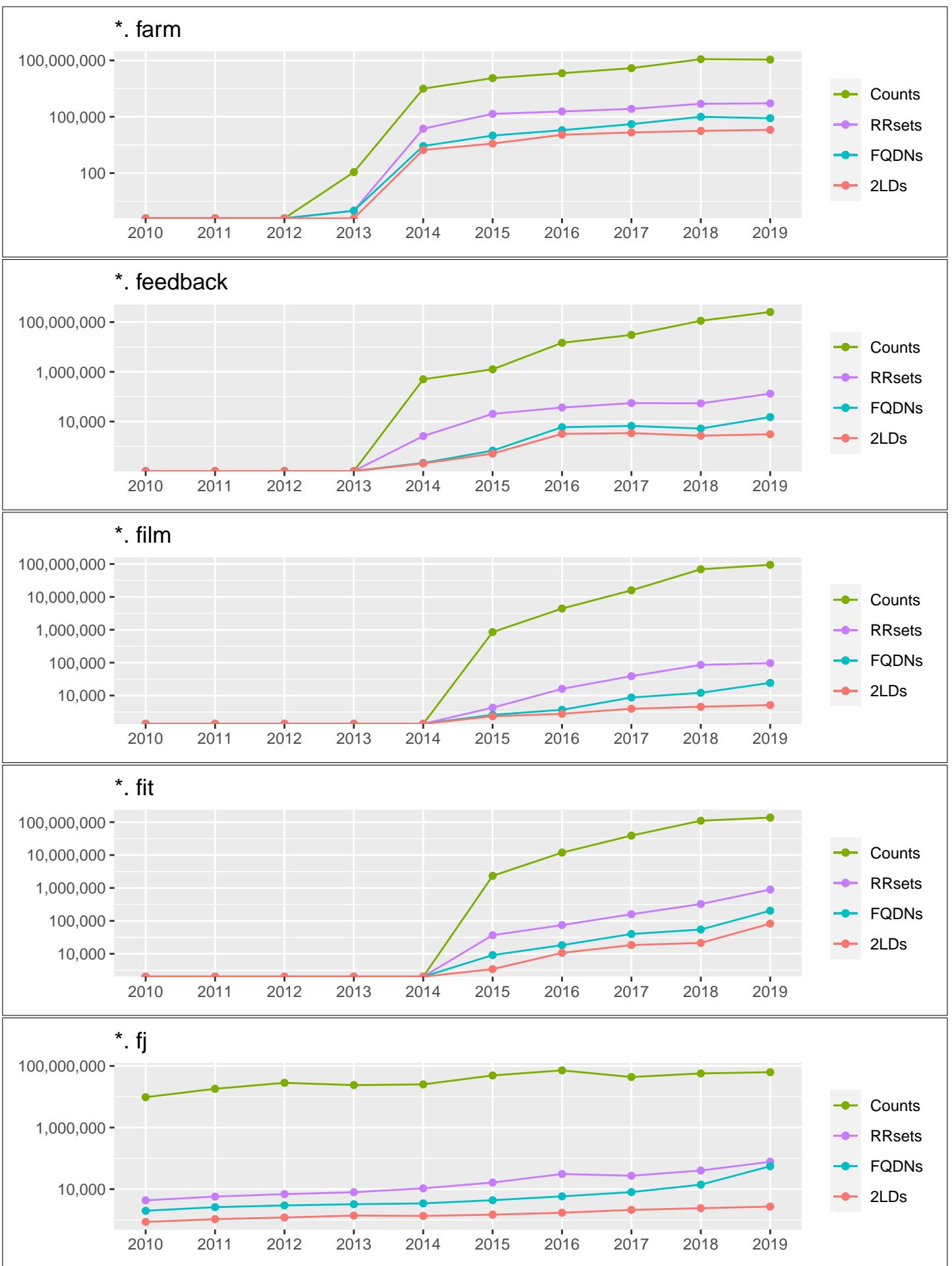






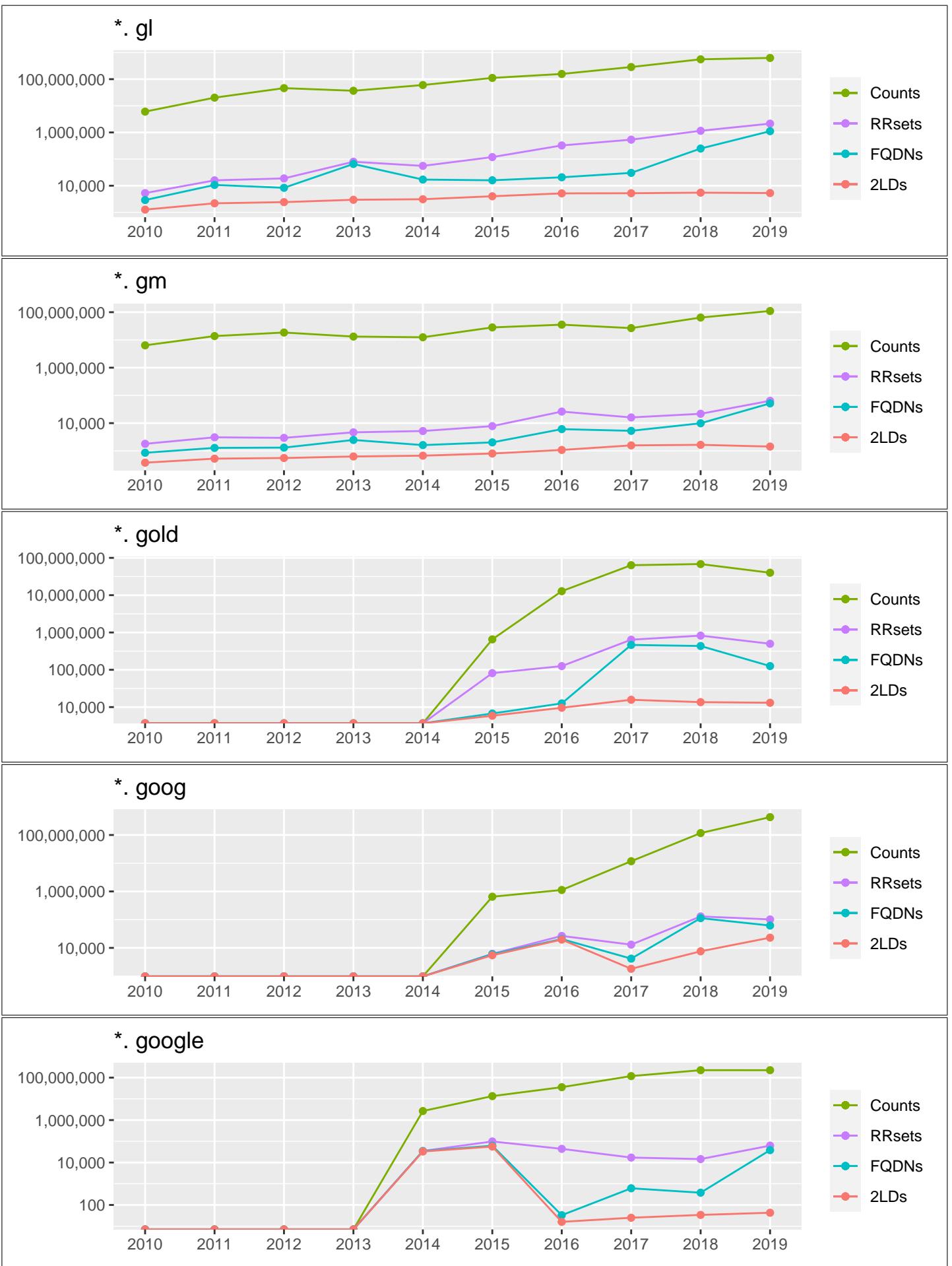














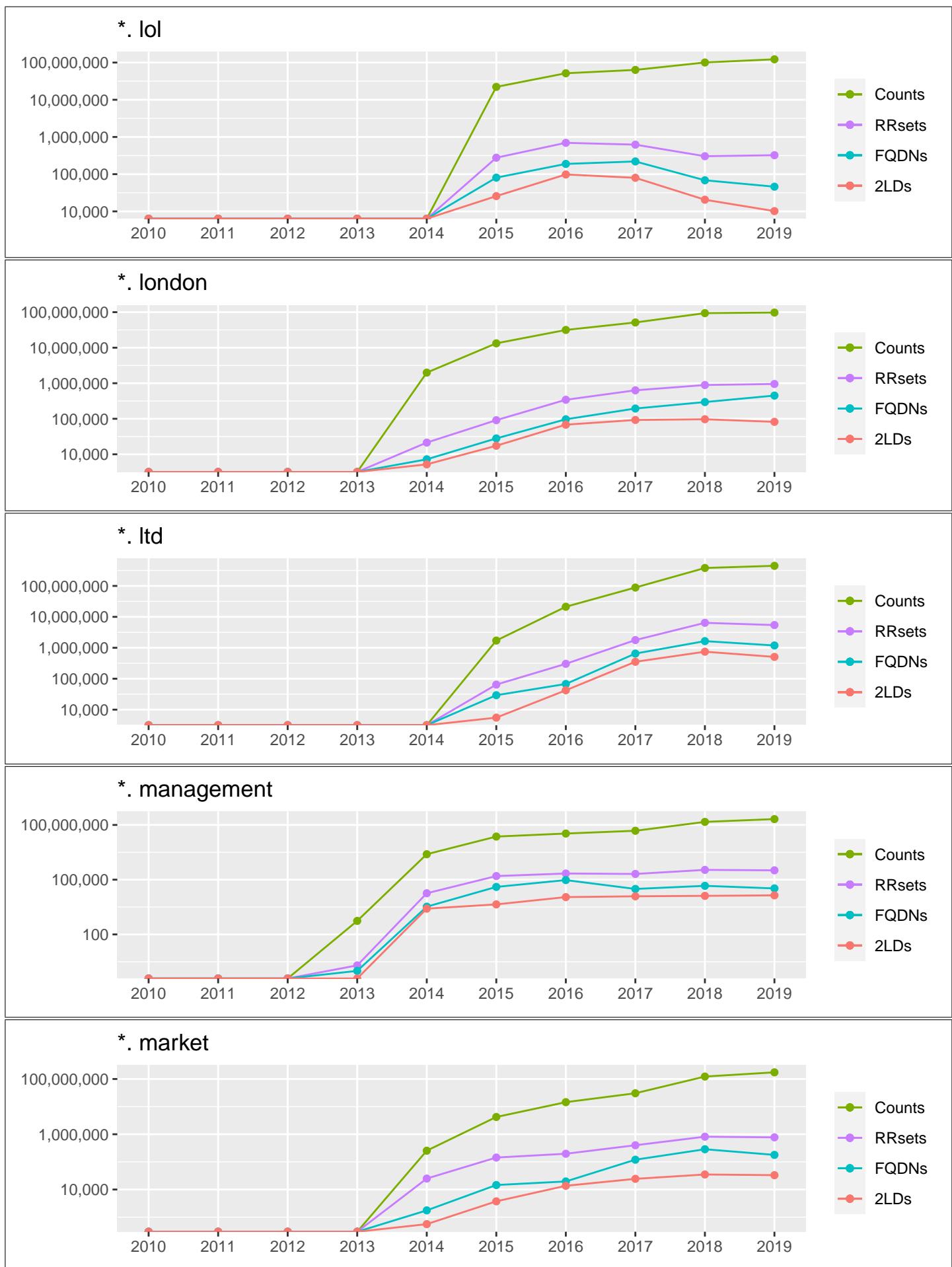




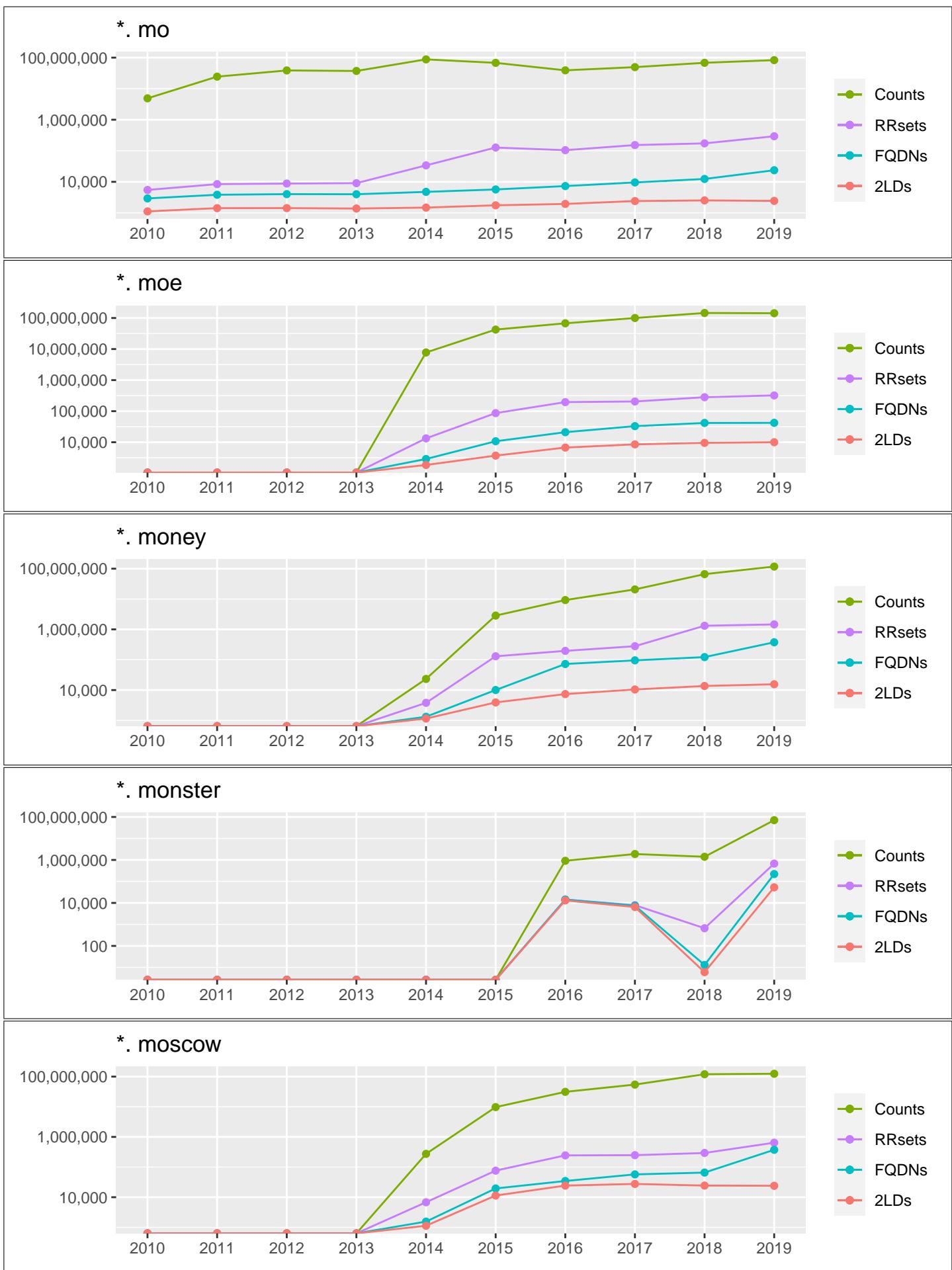




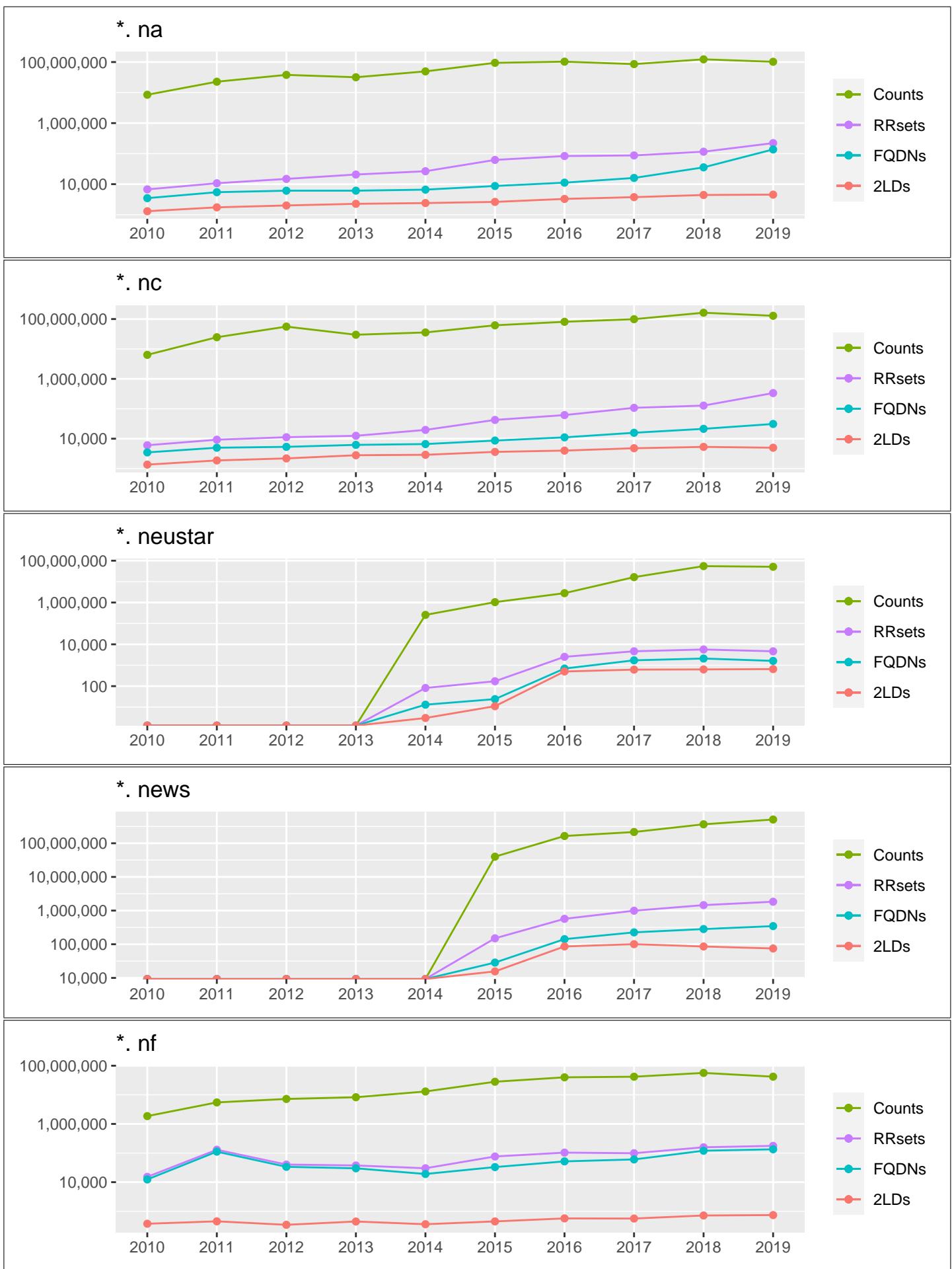


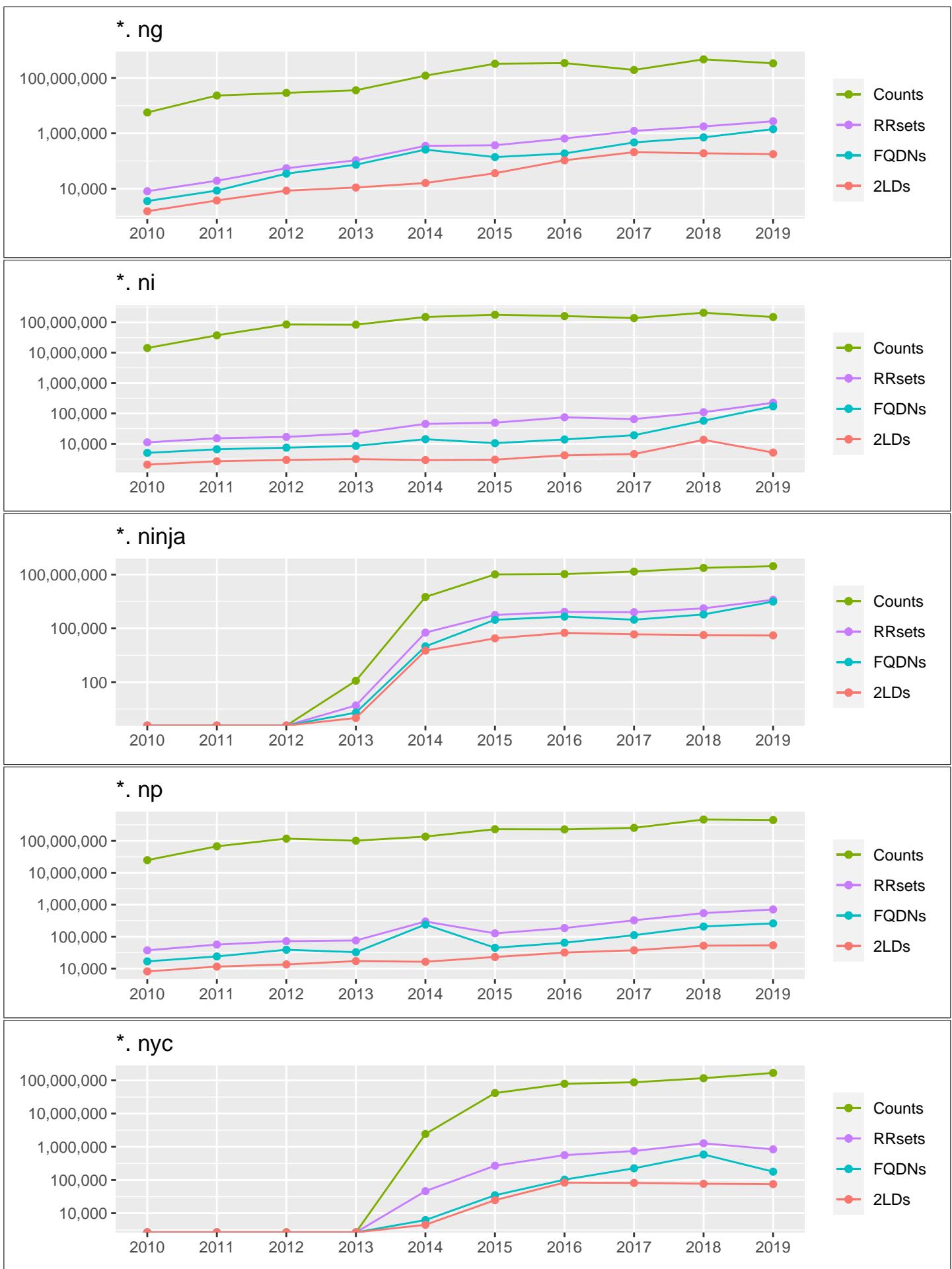


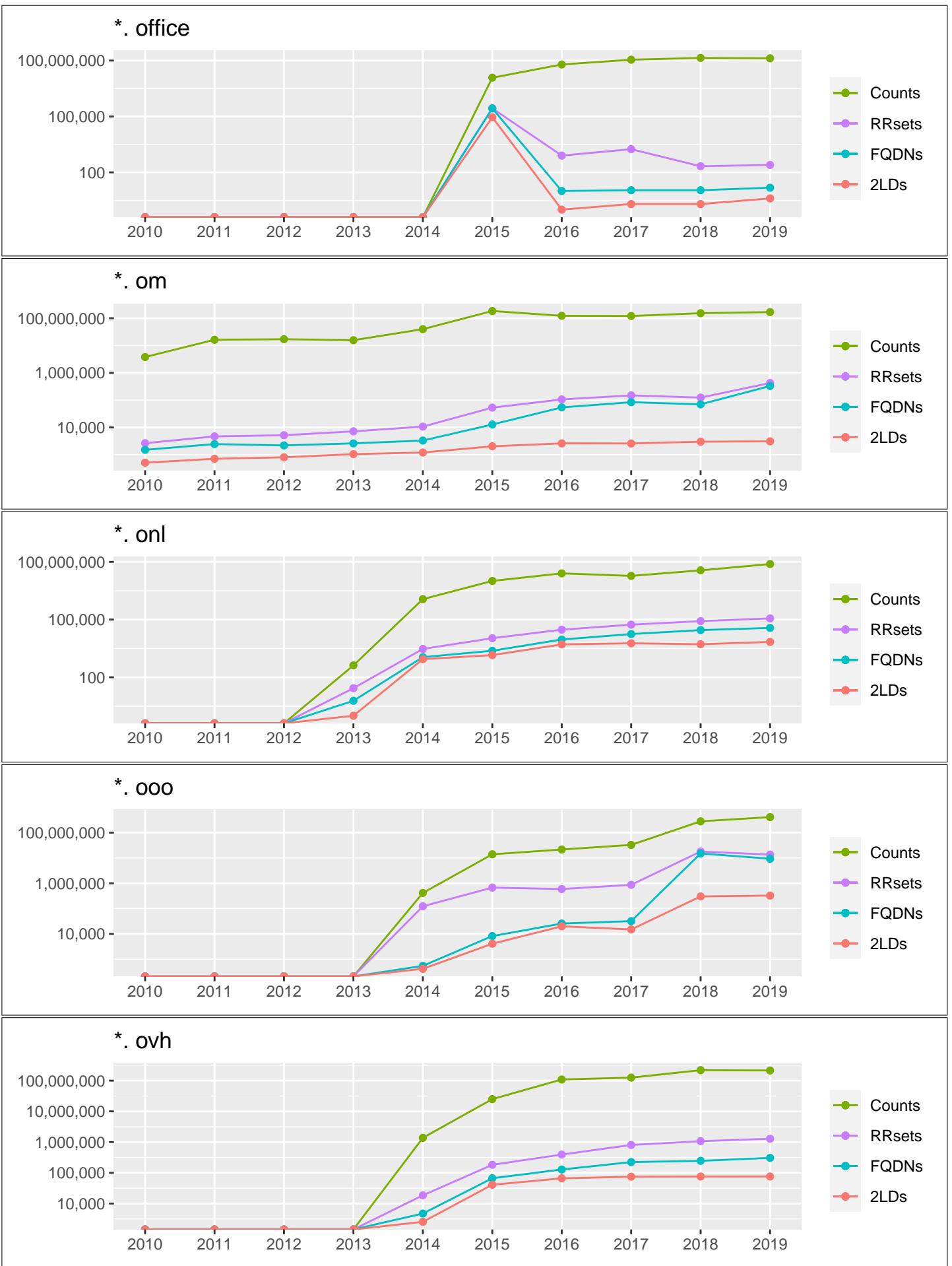


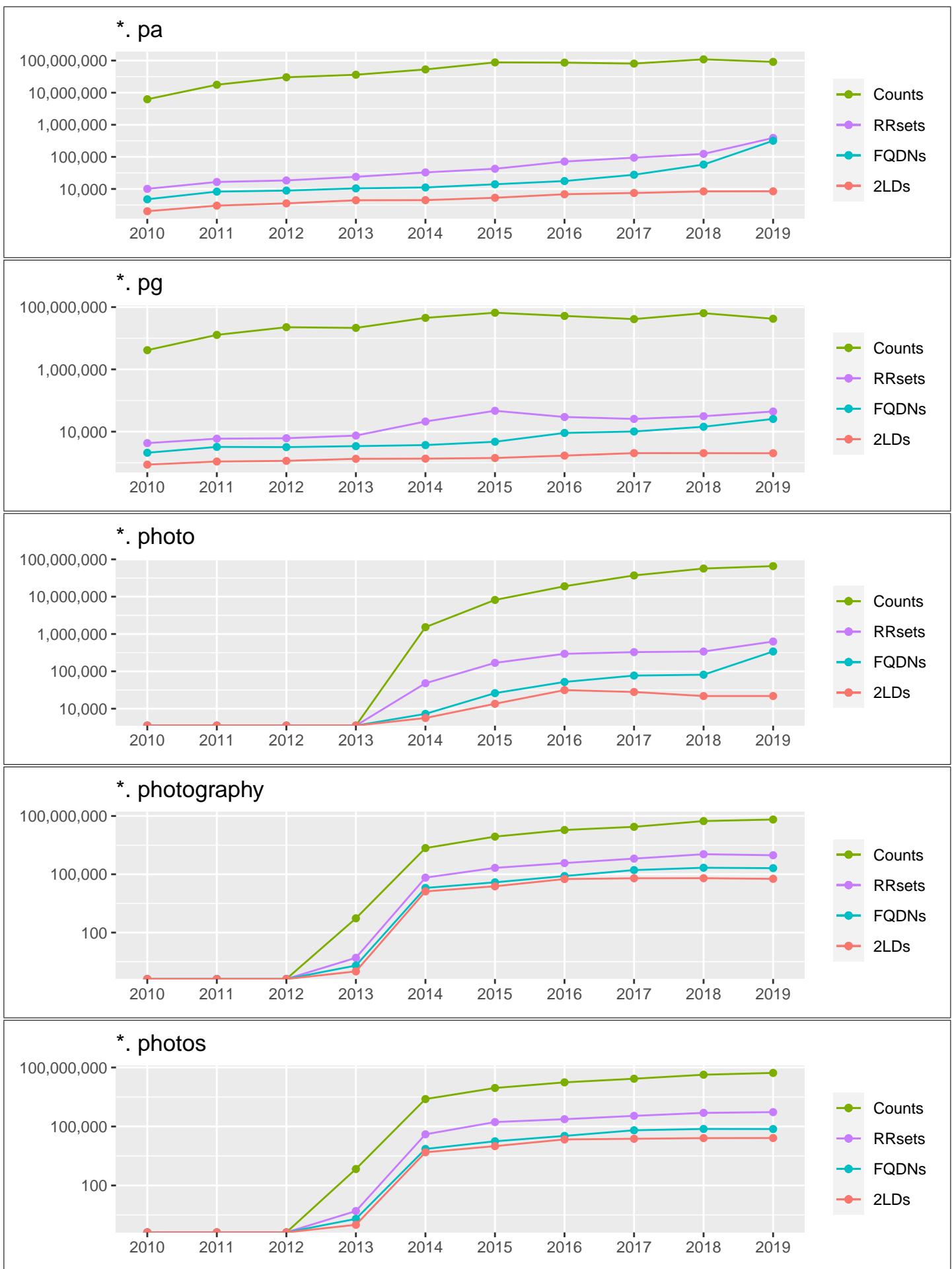




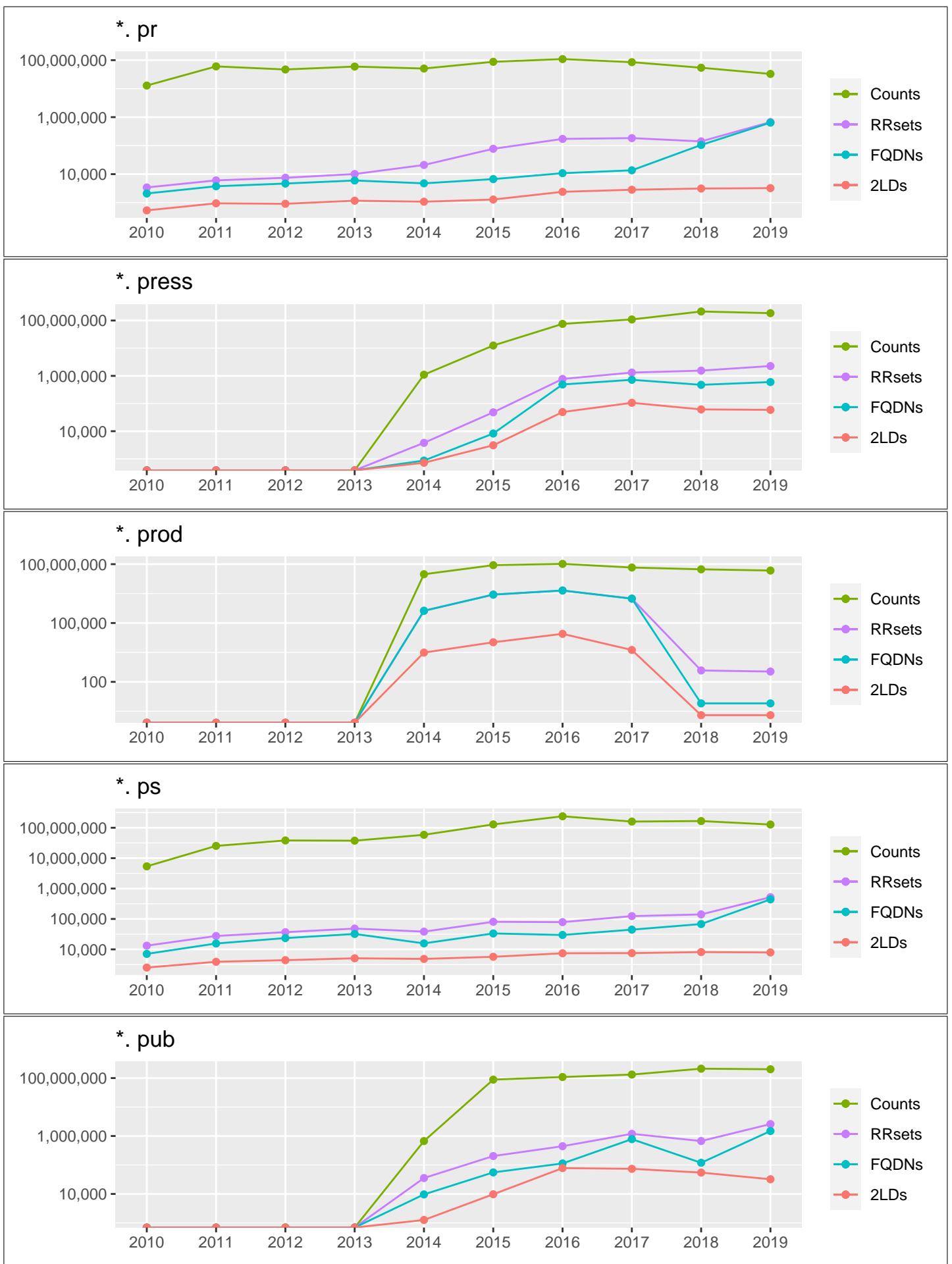


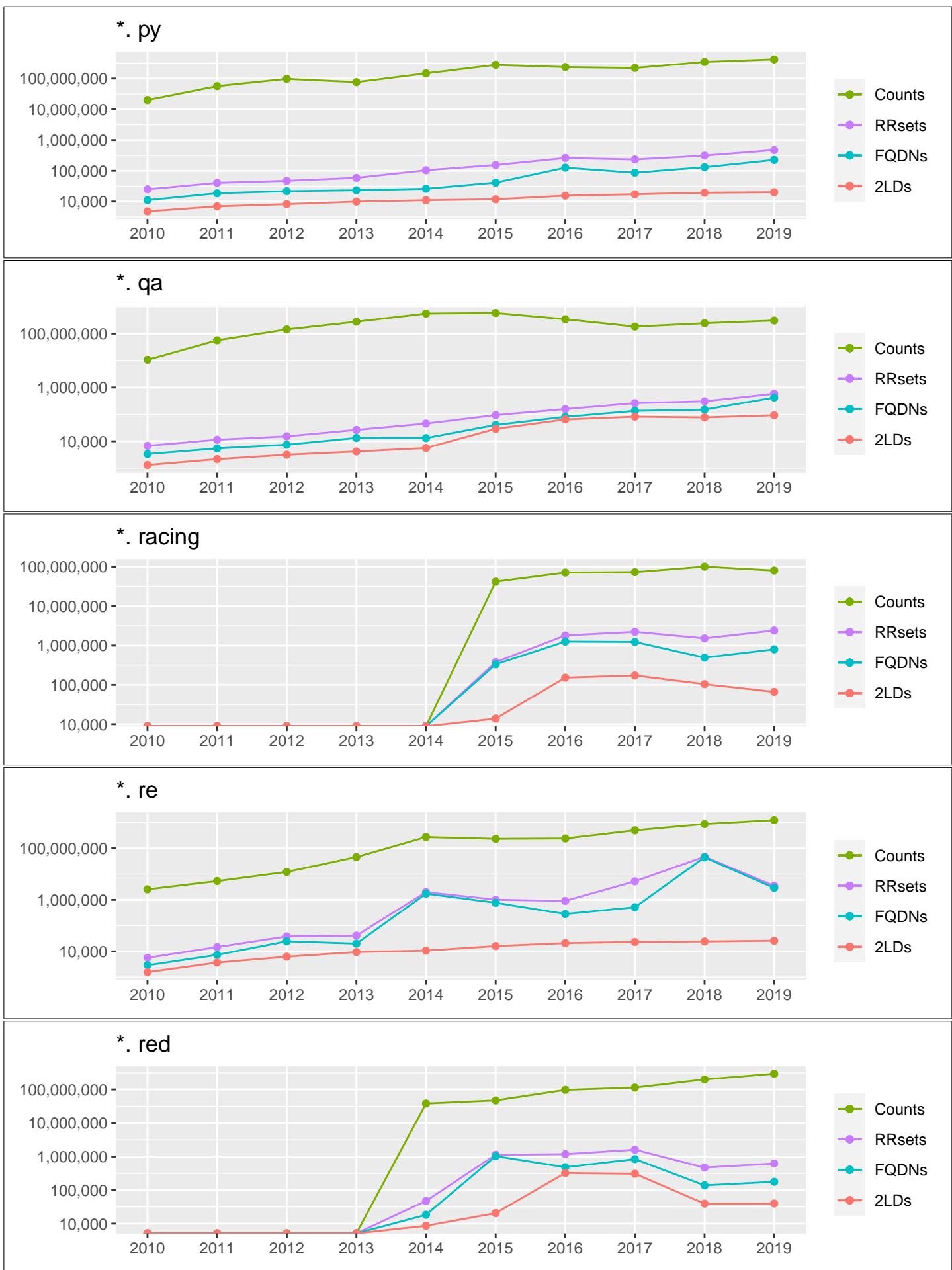








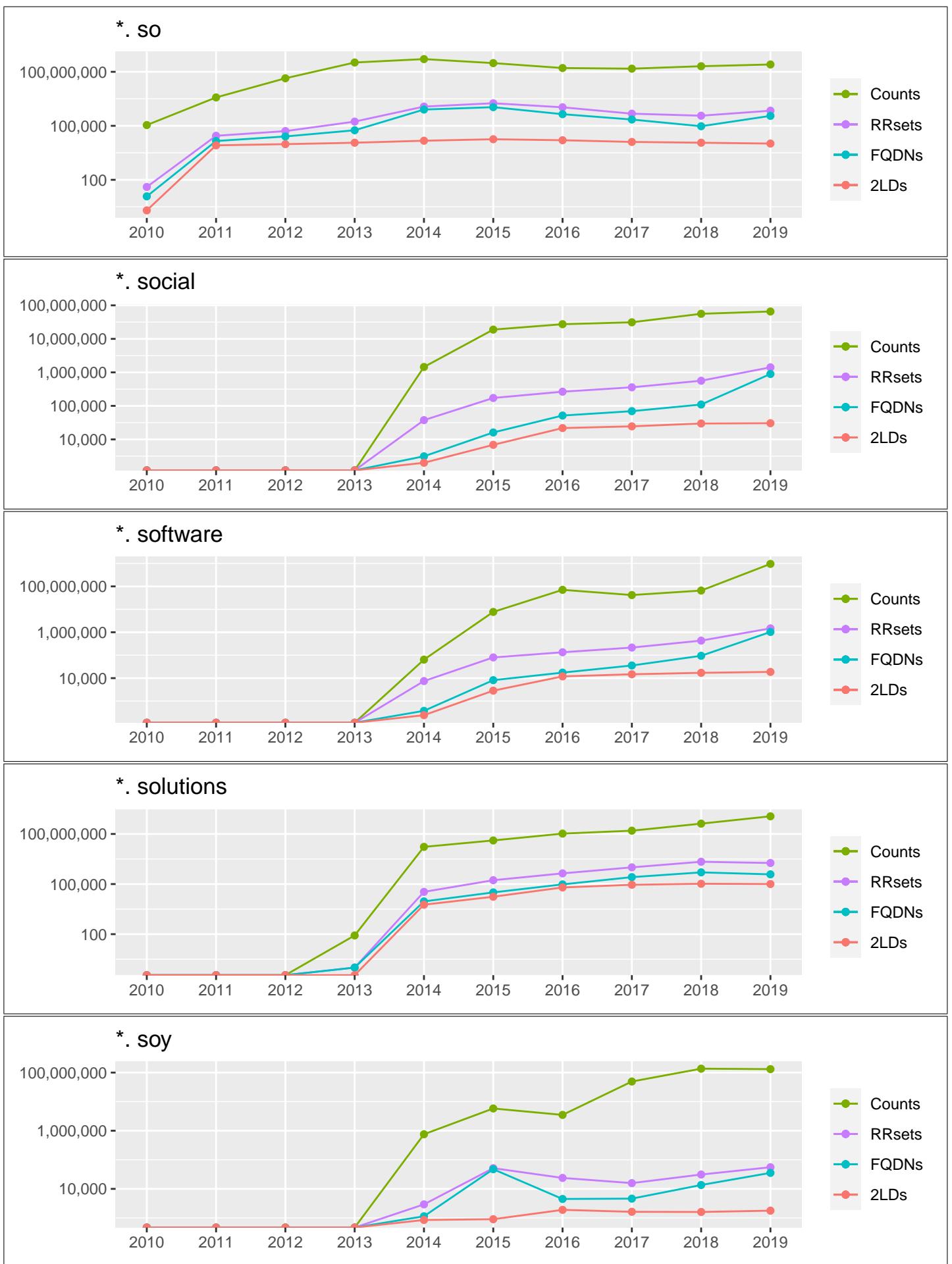








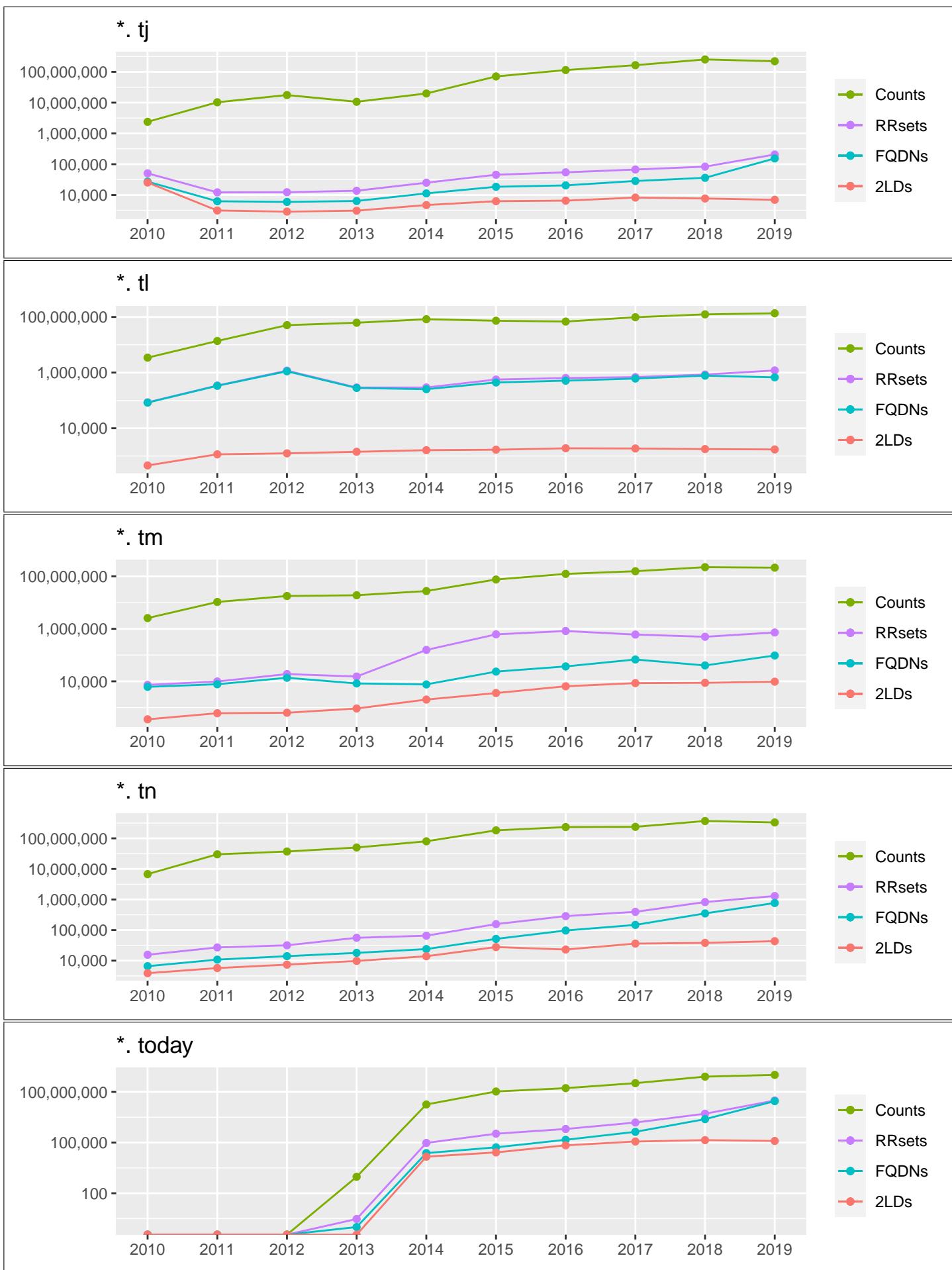


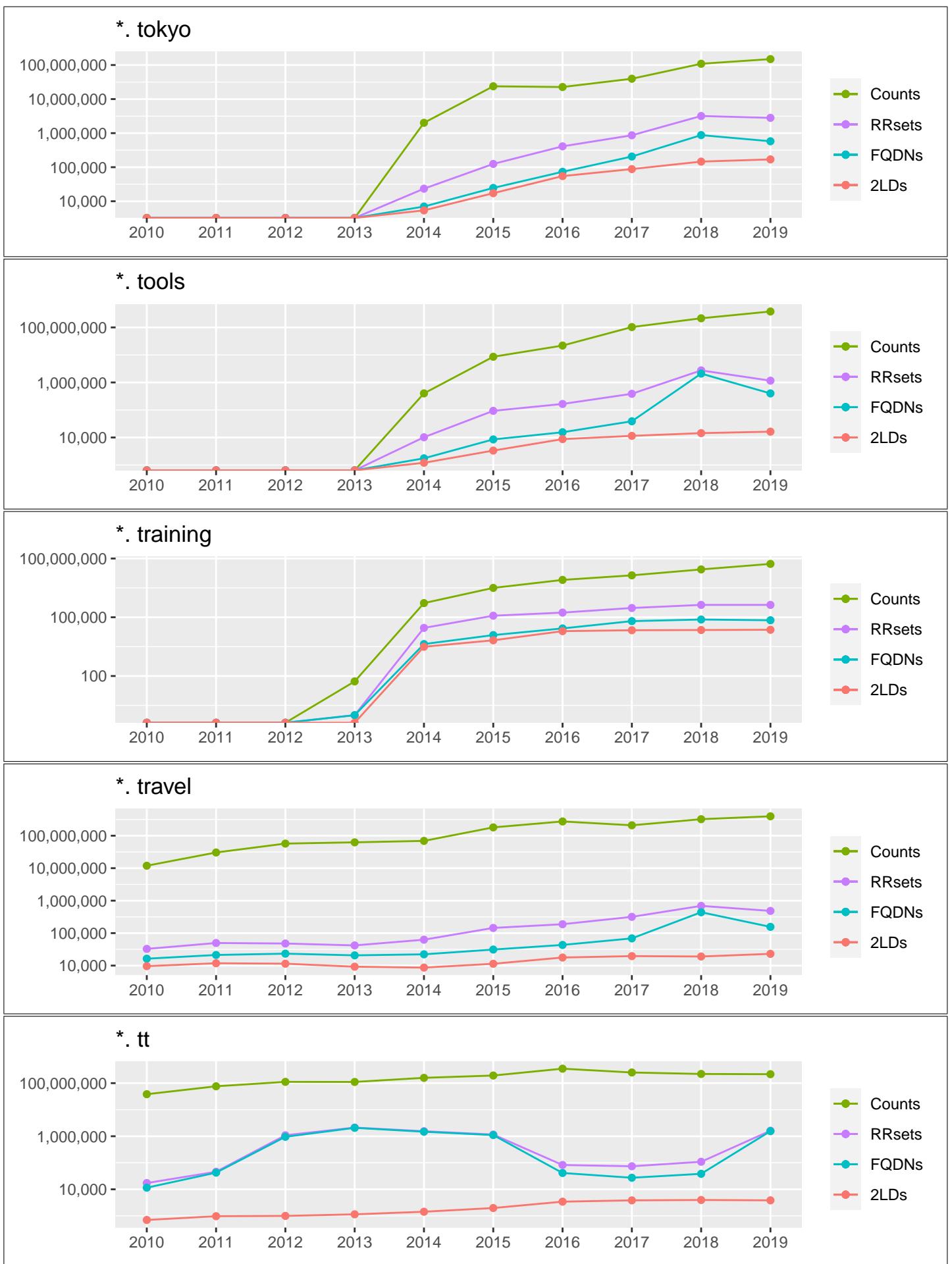


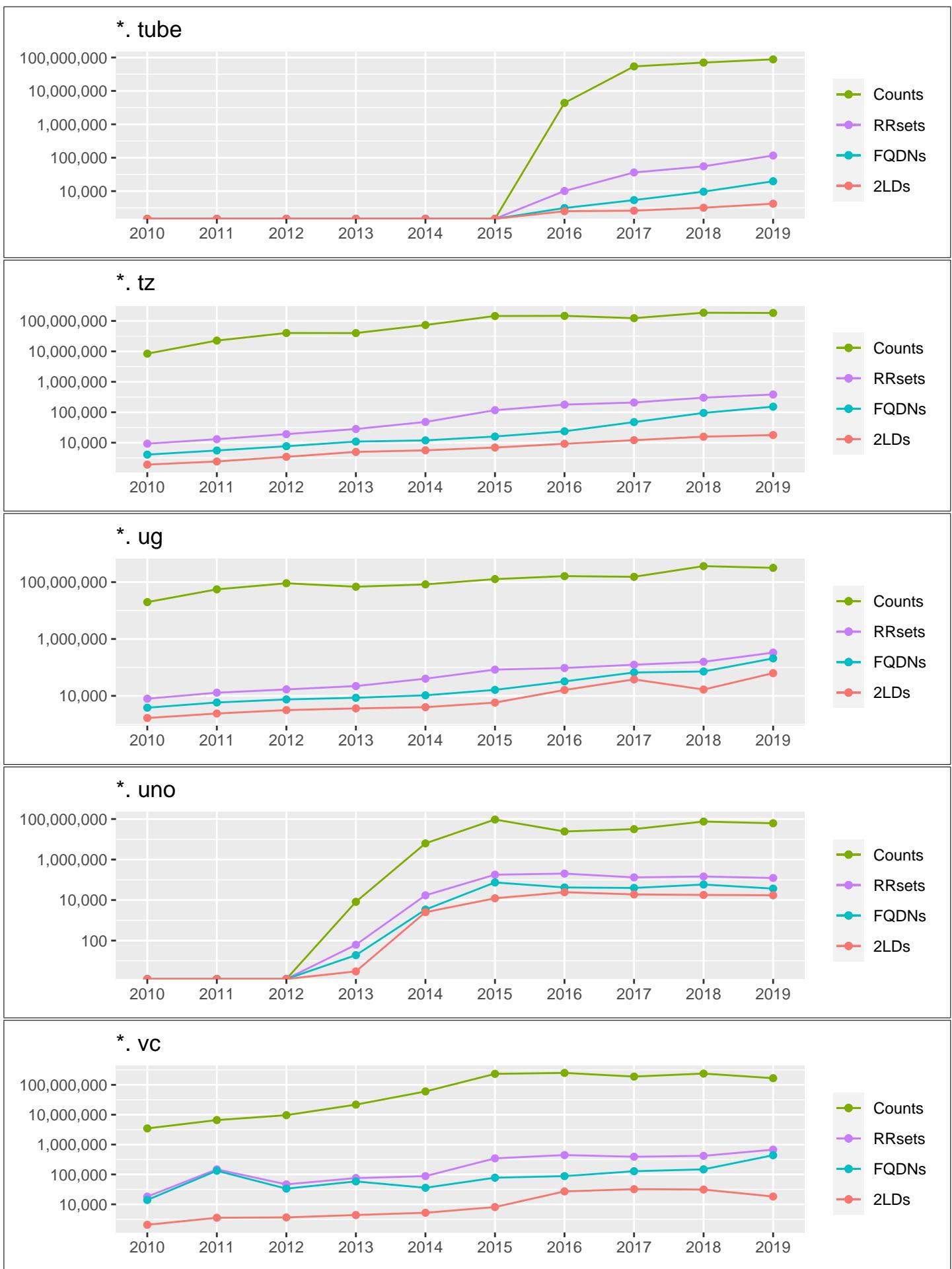




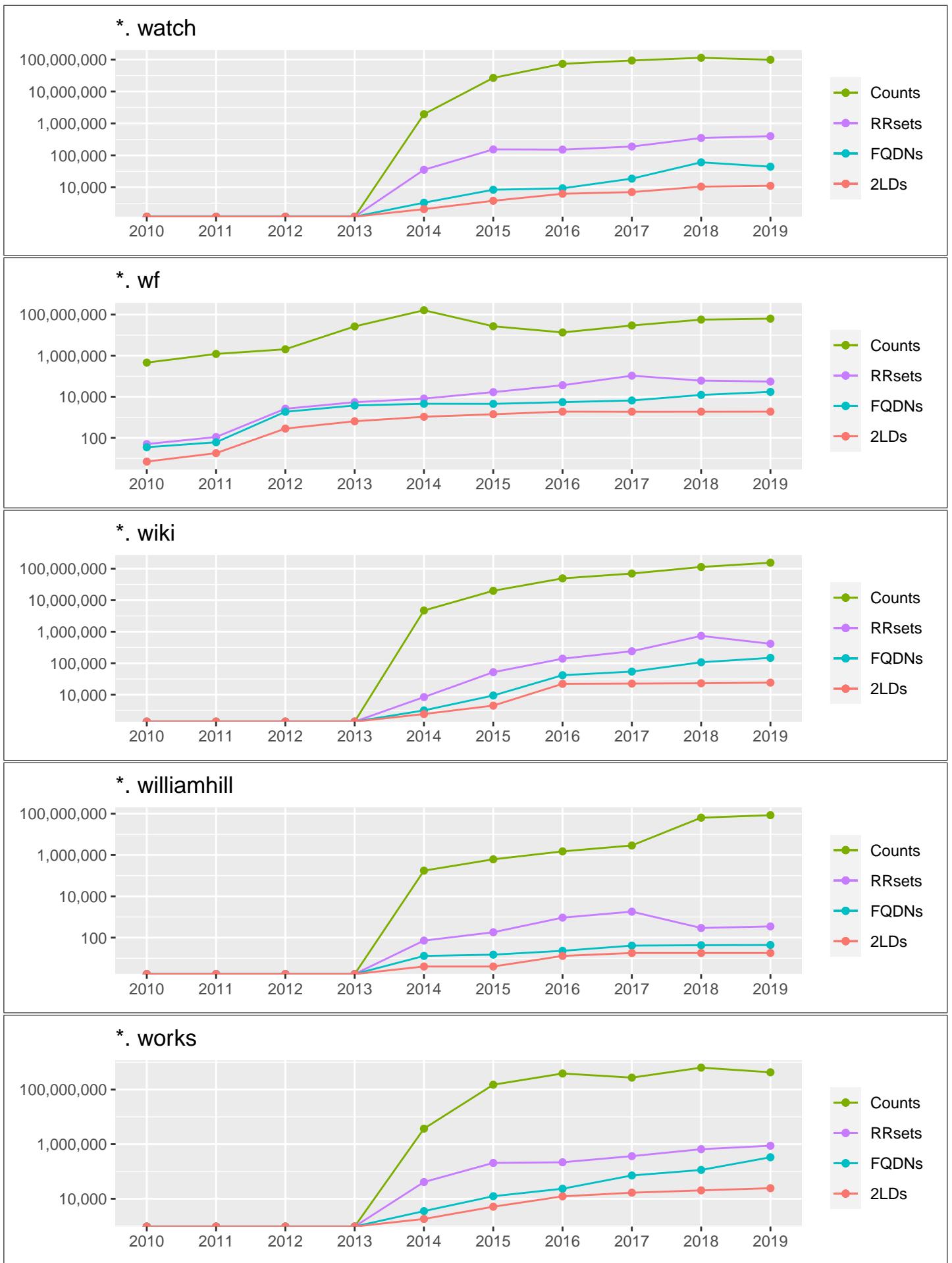


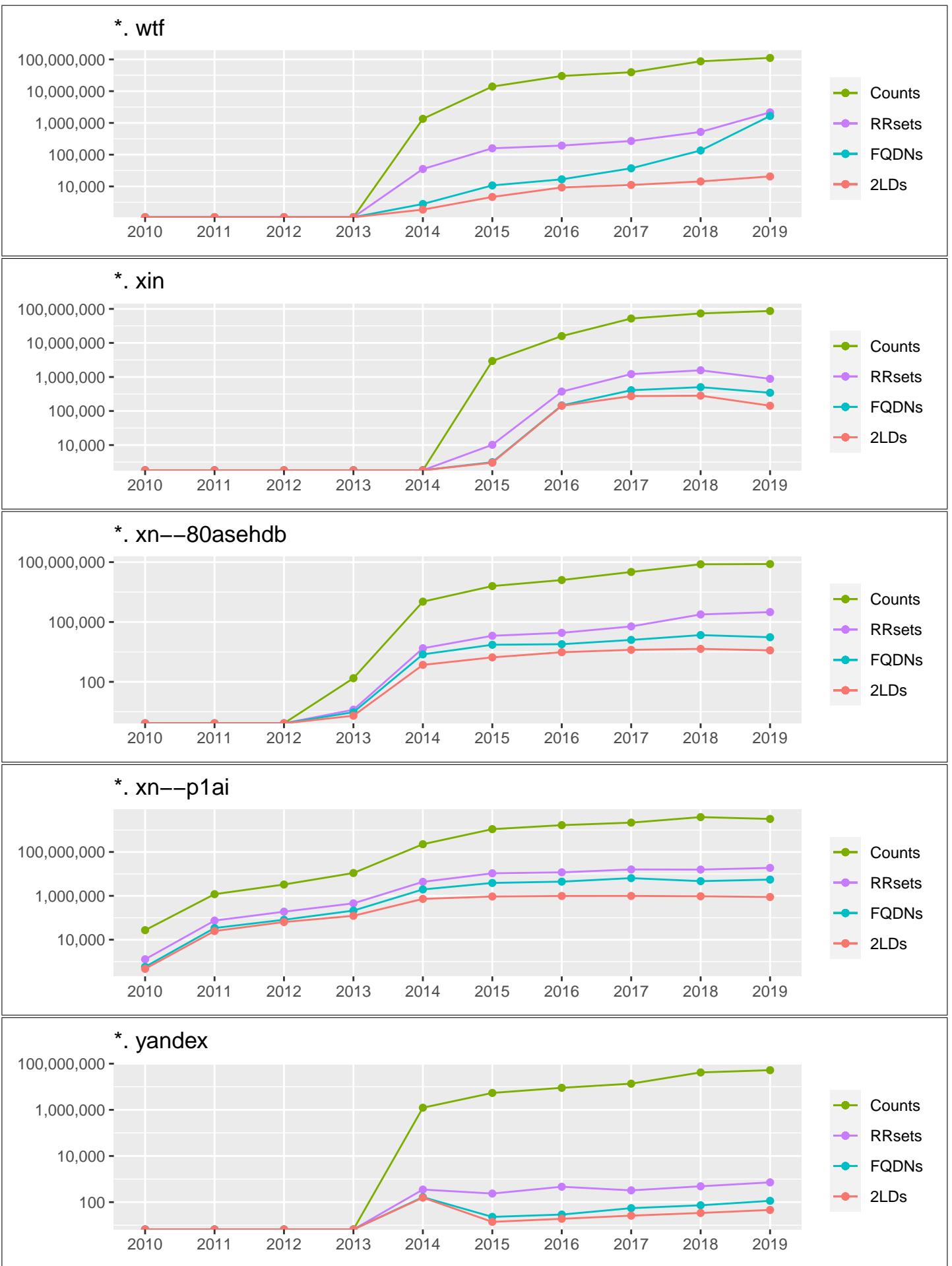


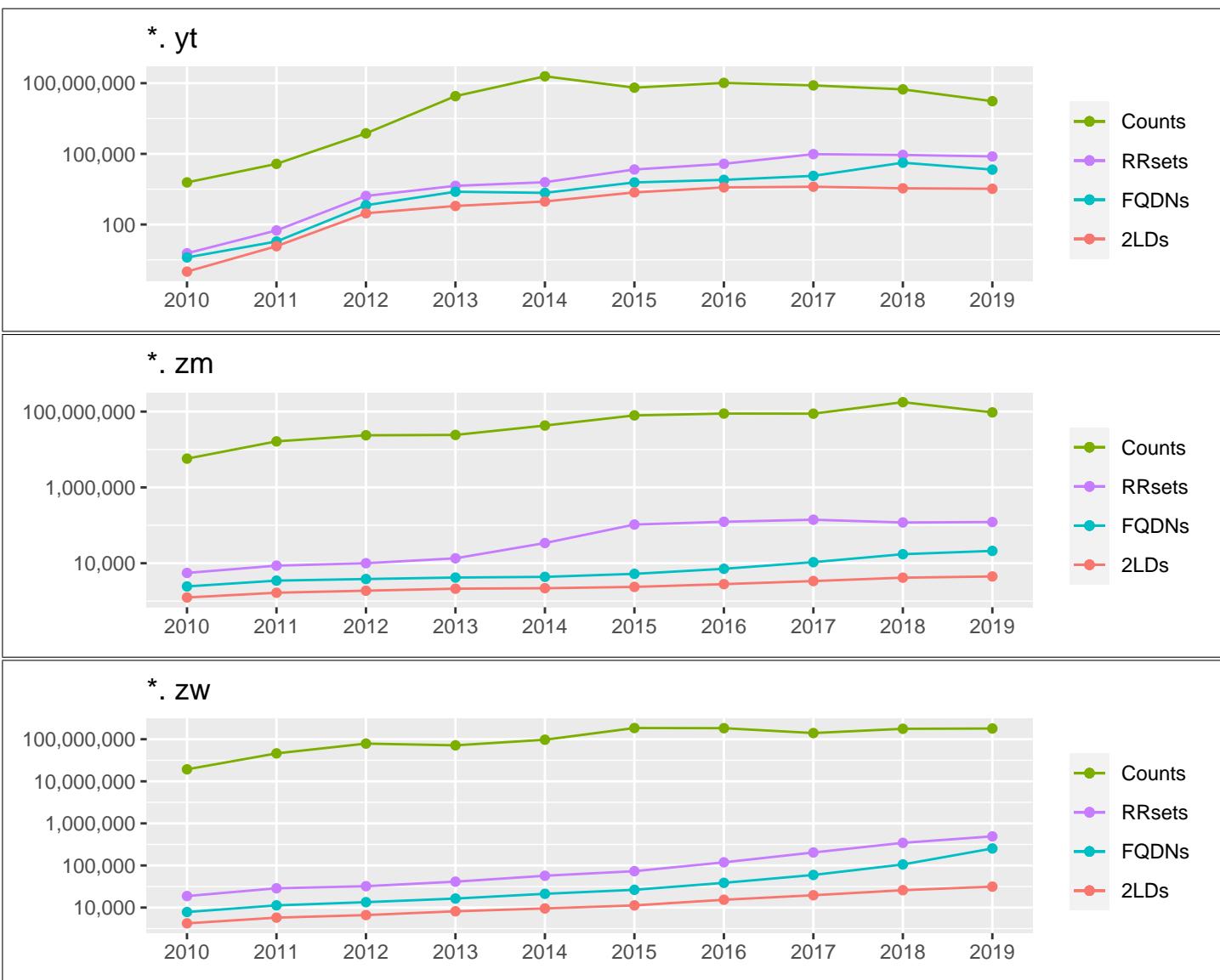






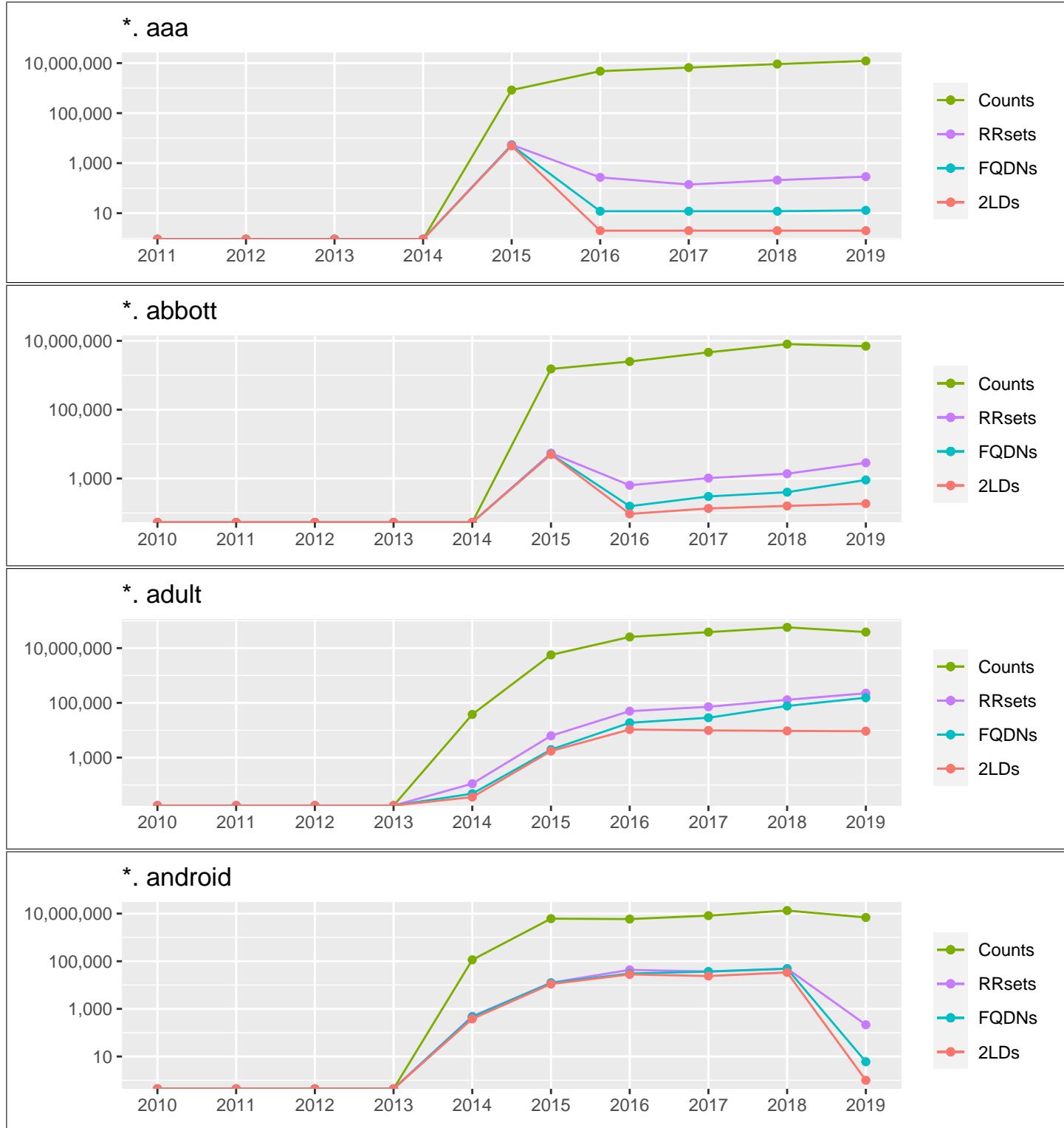


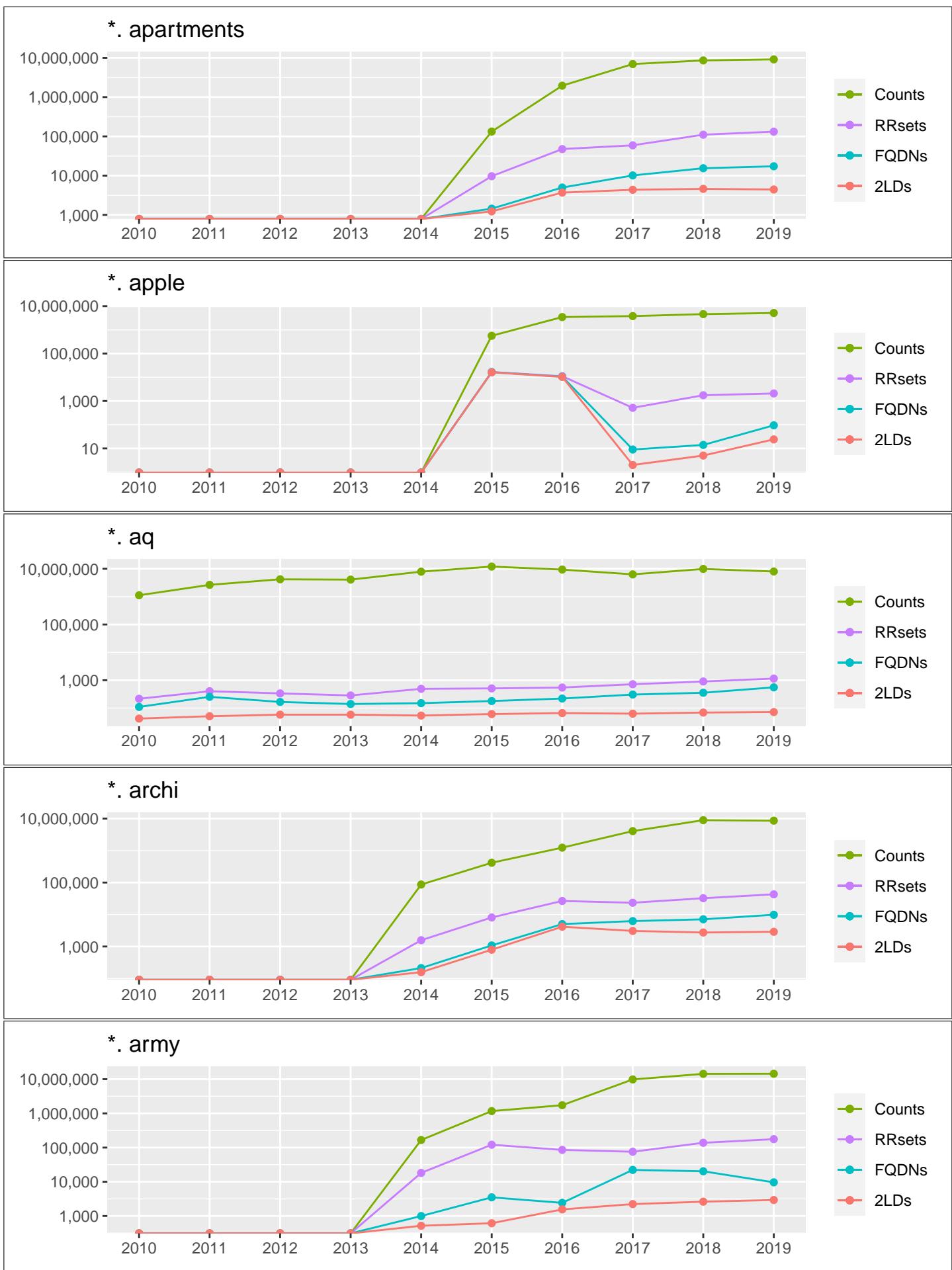


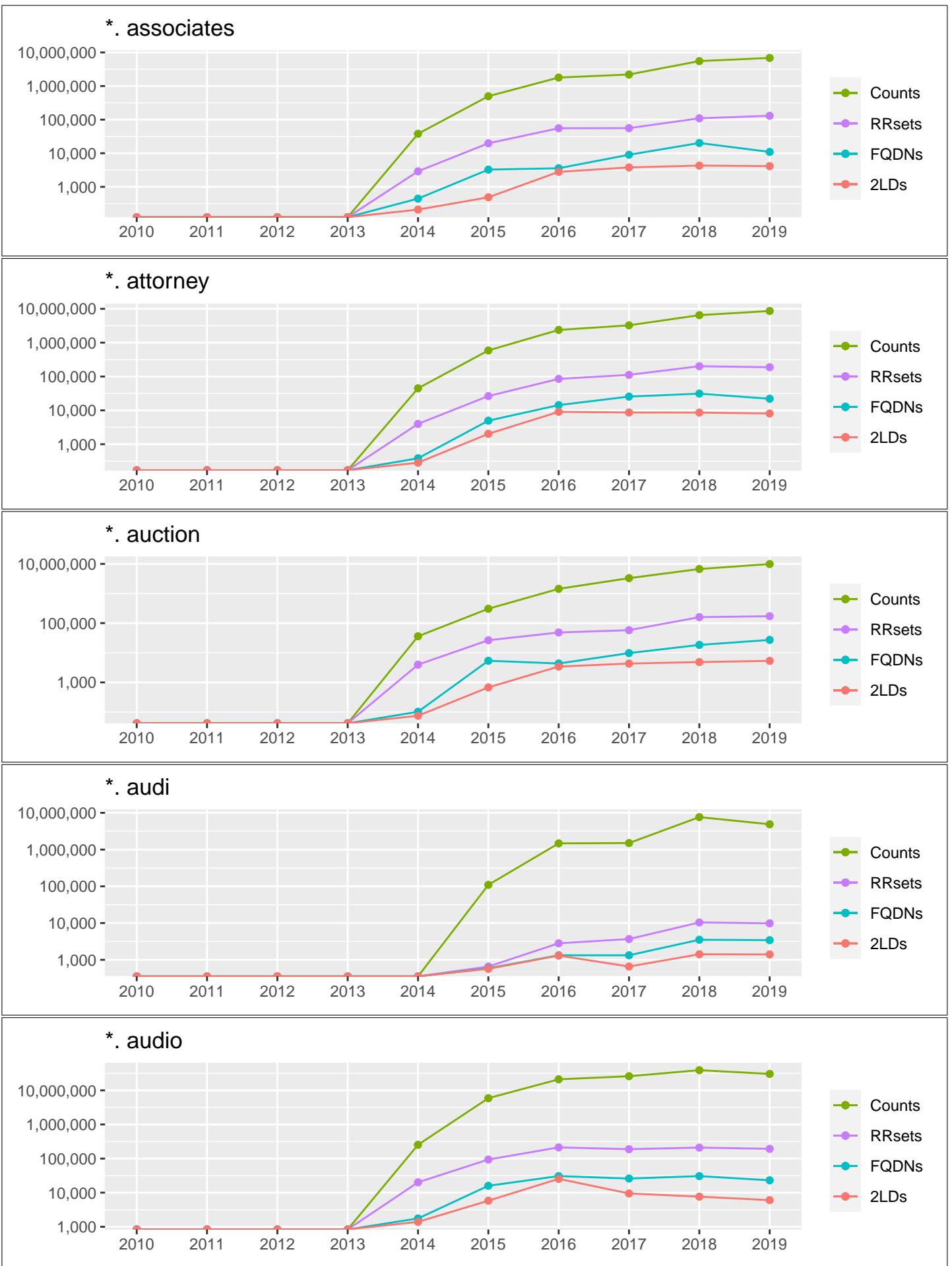


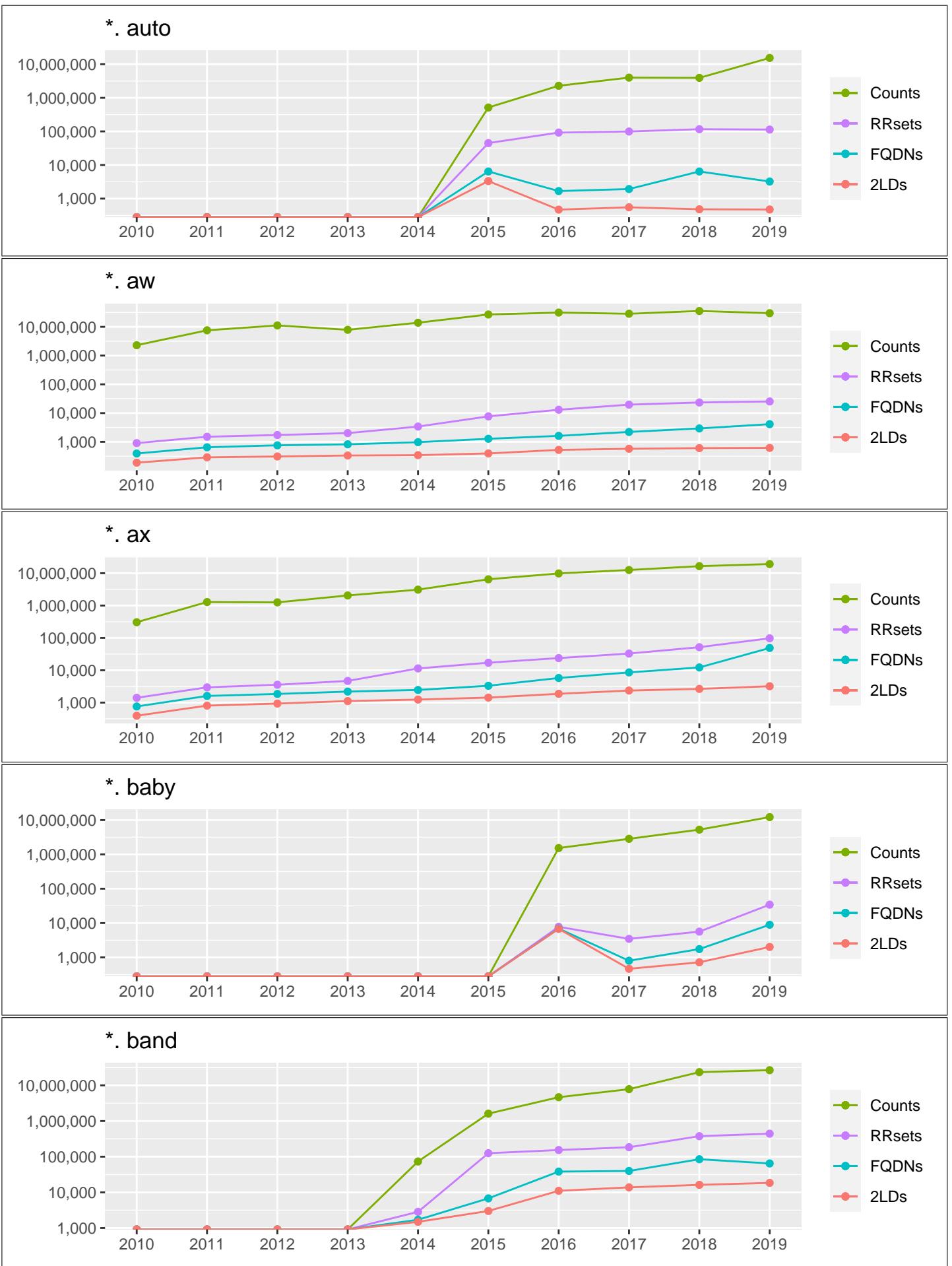
Chapter 7

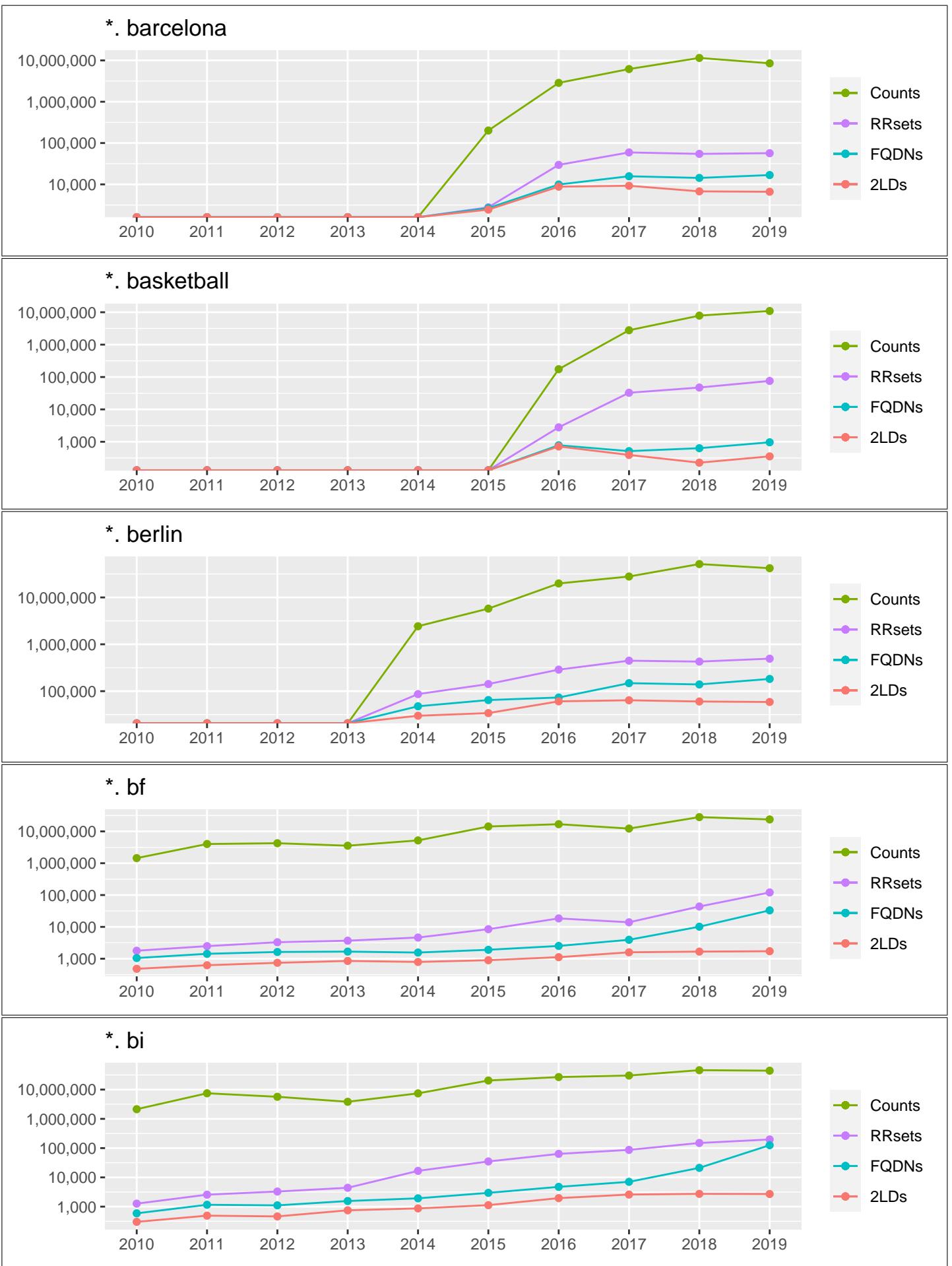
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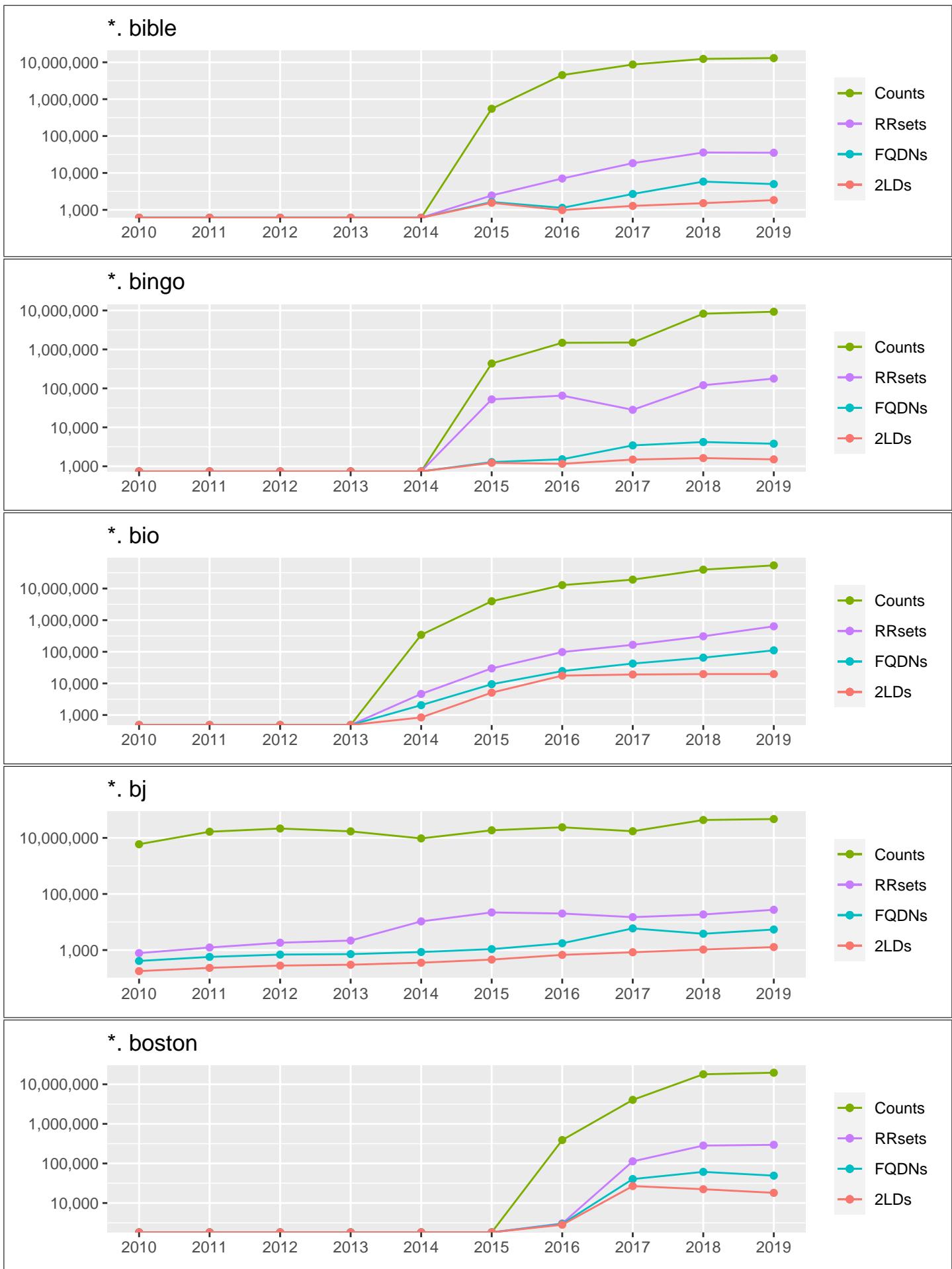


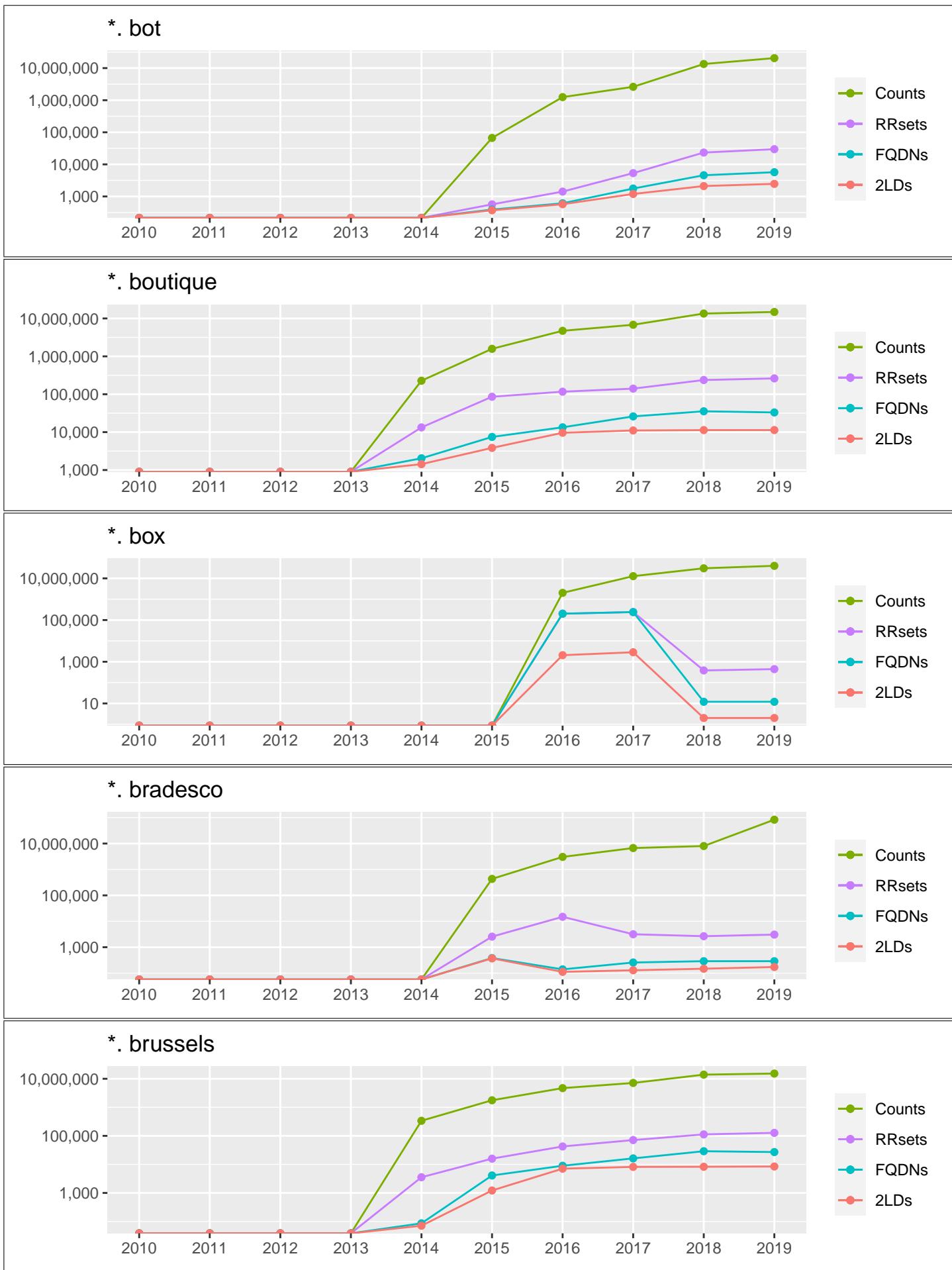


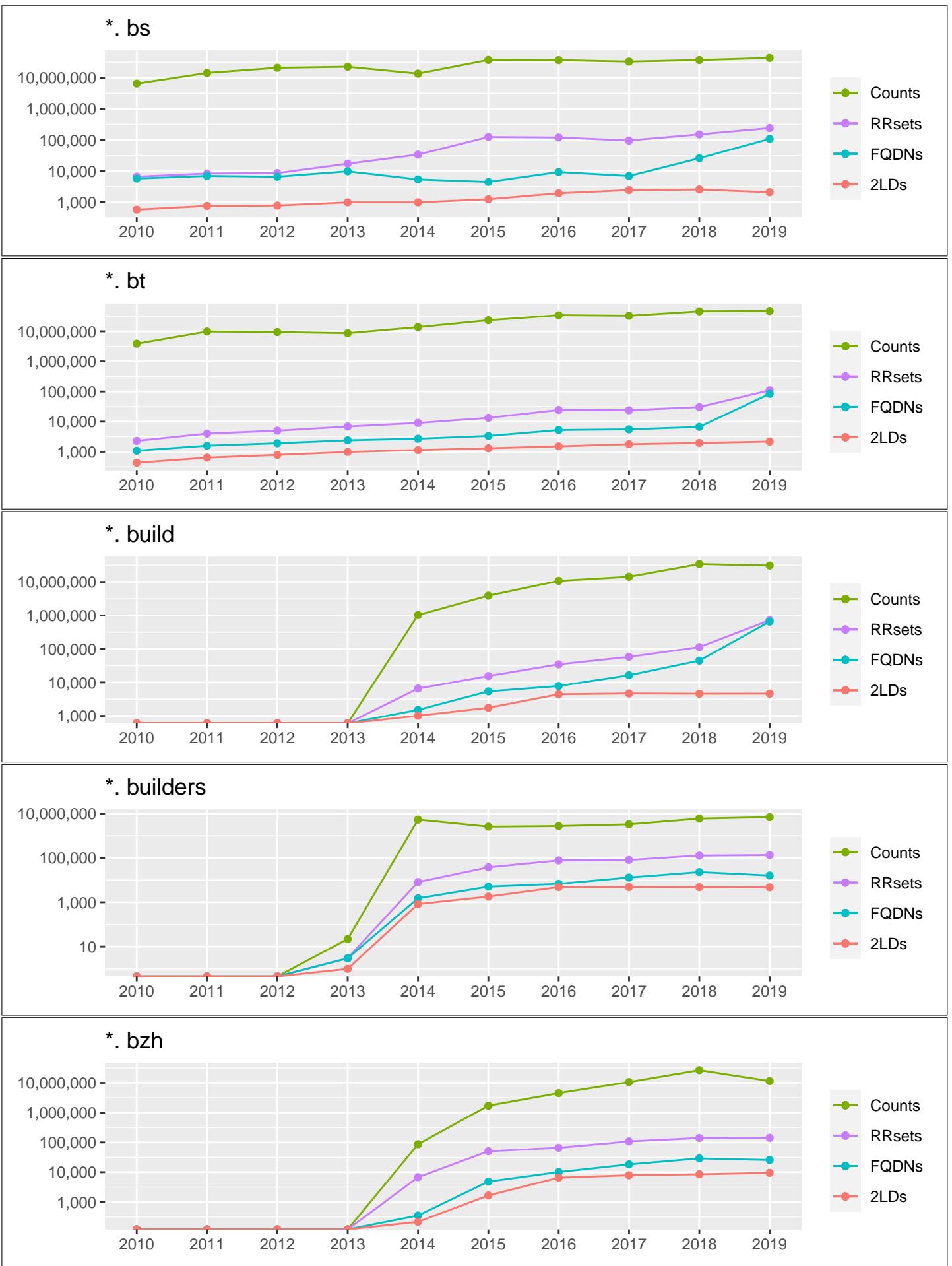


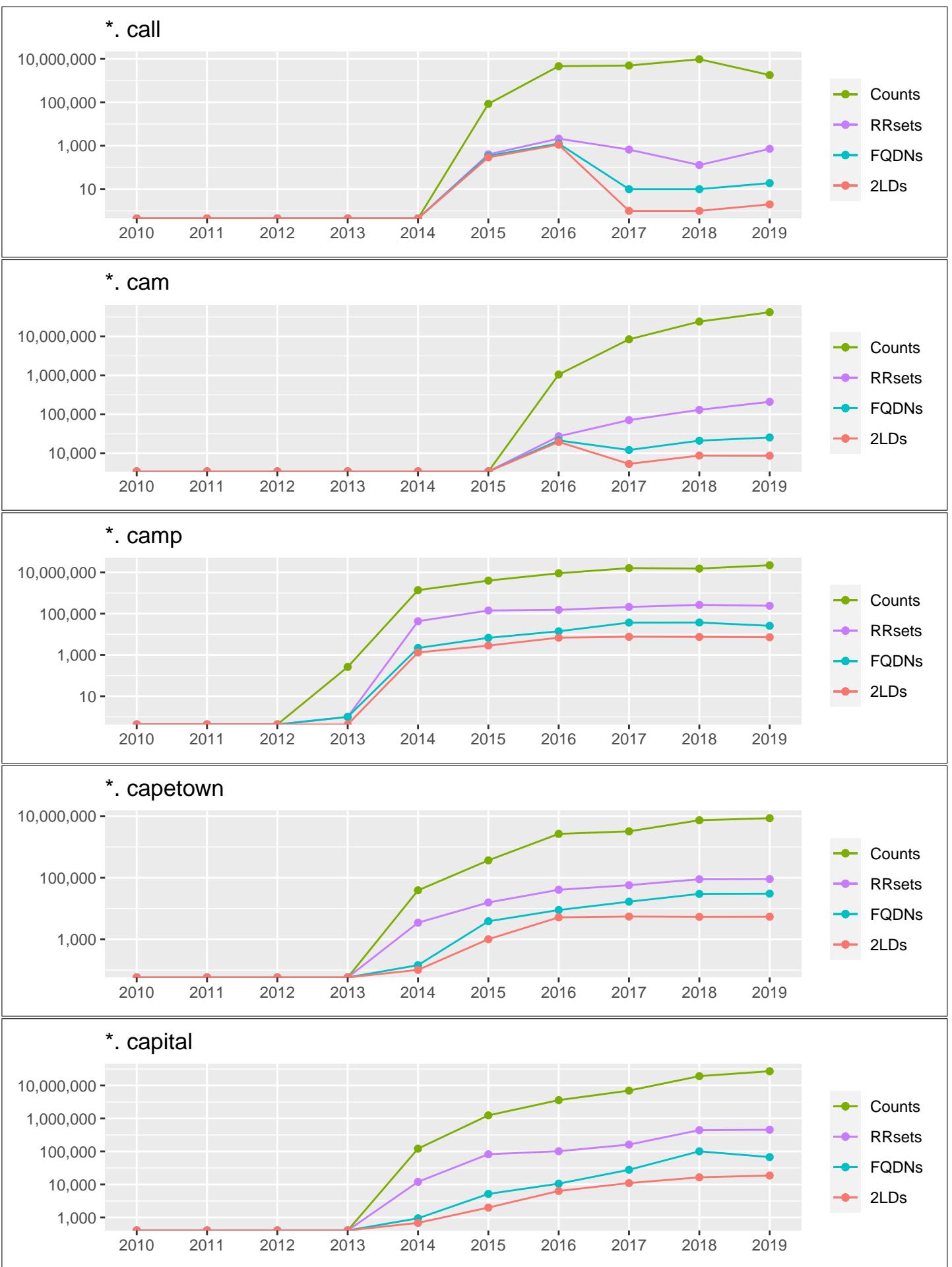




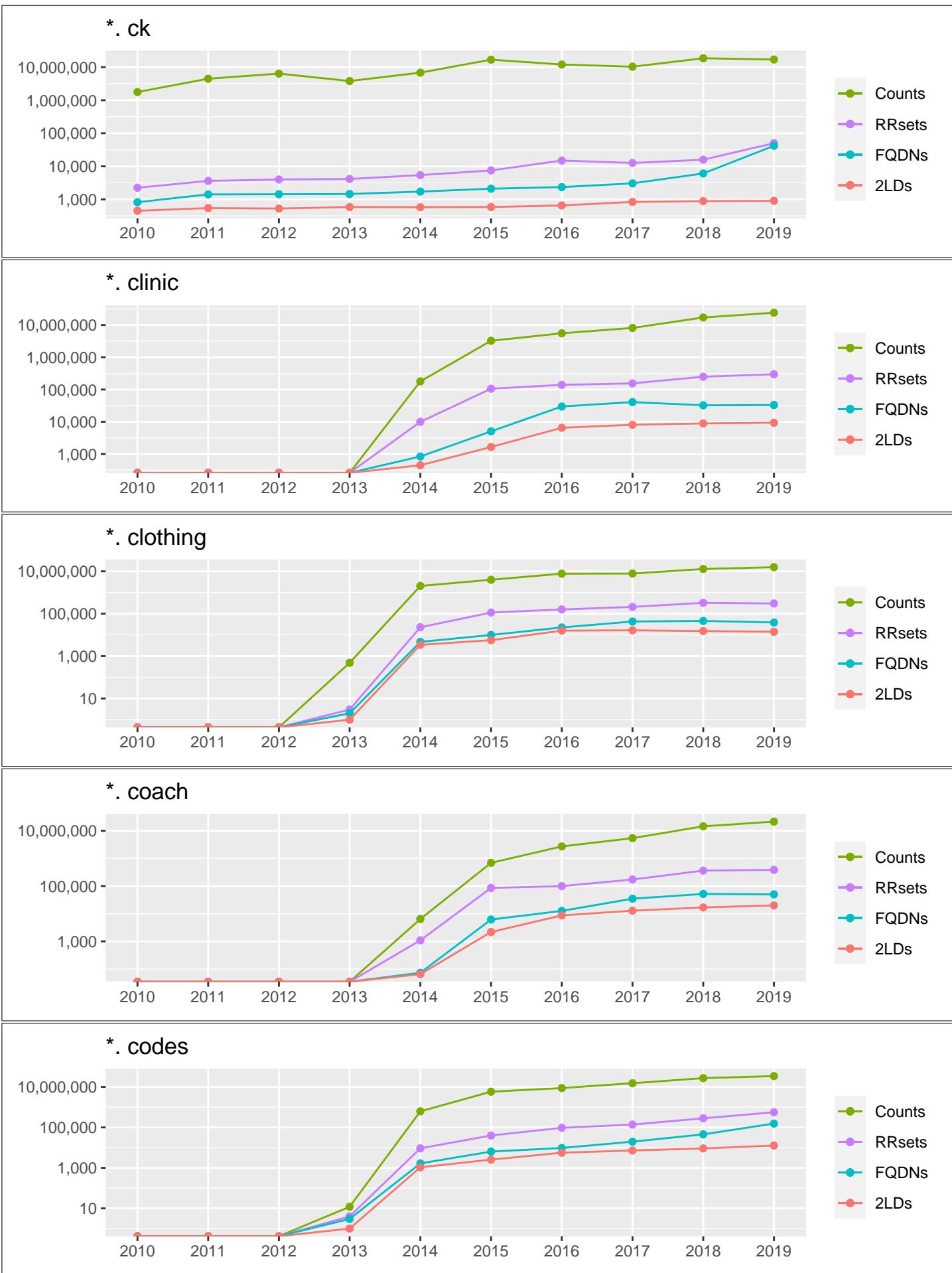




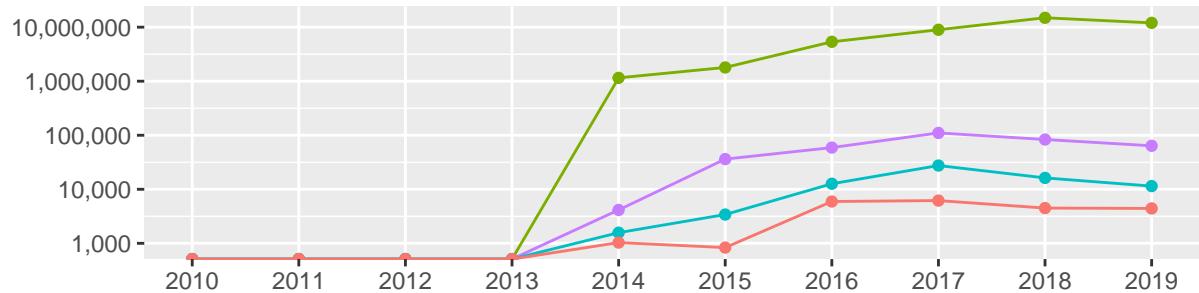




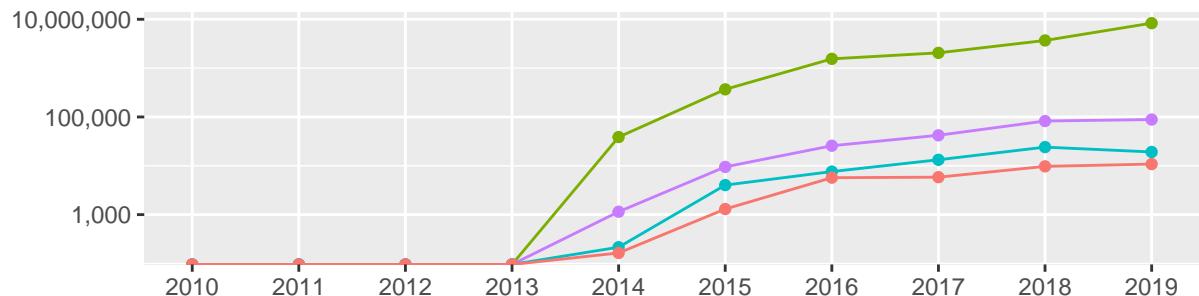




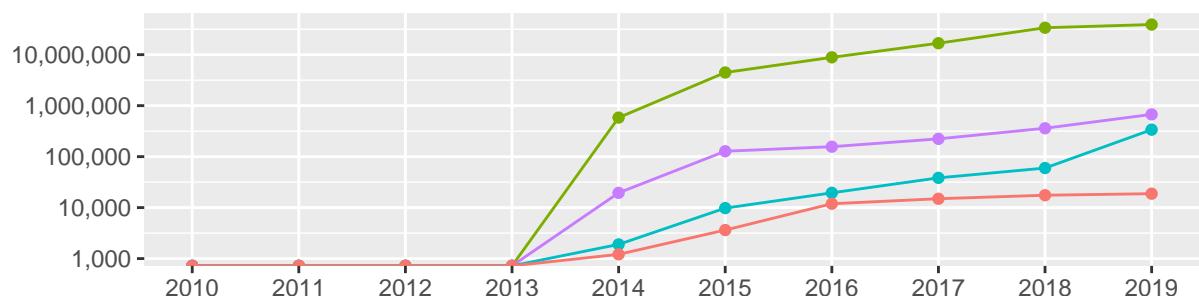
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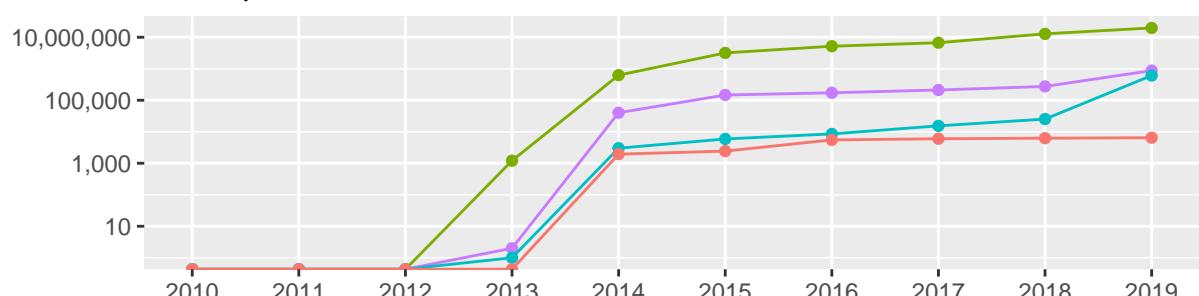
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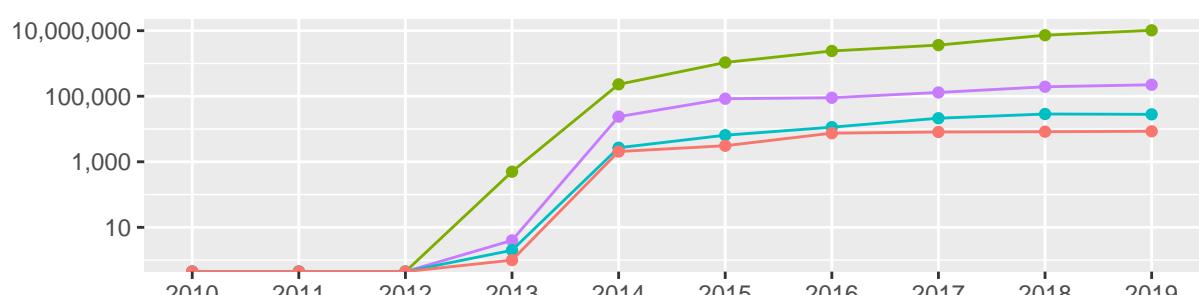
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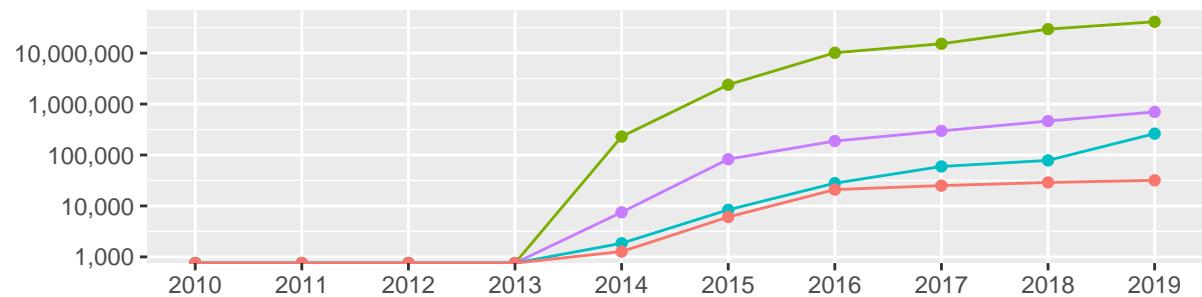
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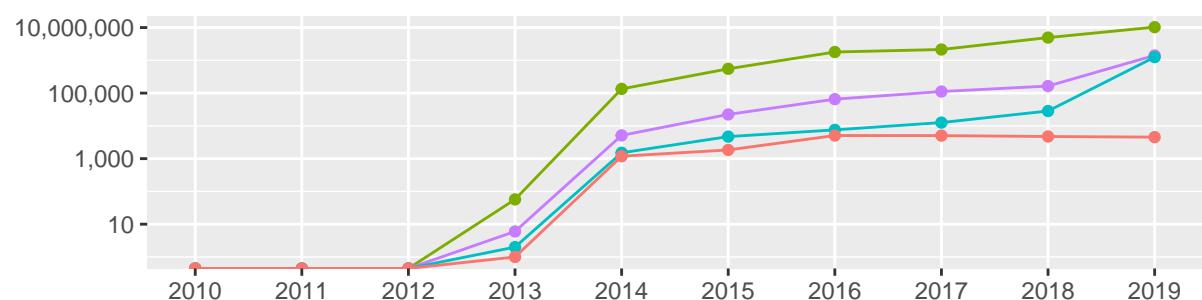
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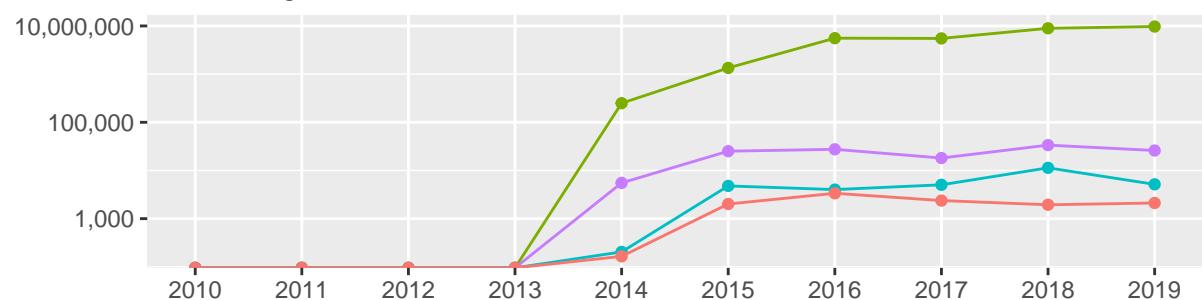
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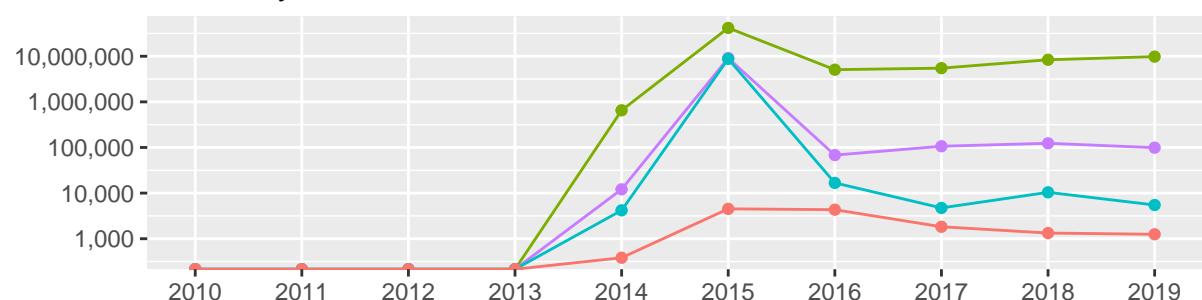
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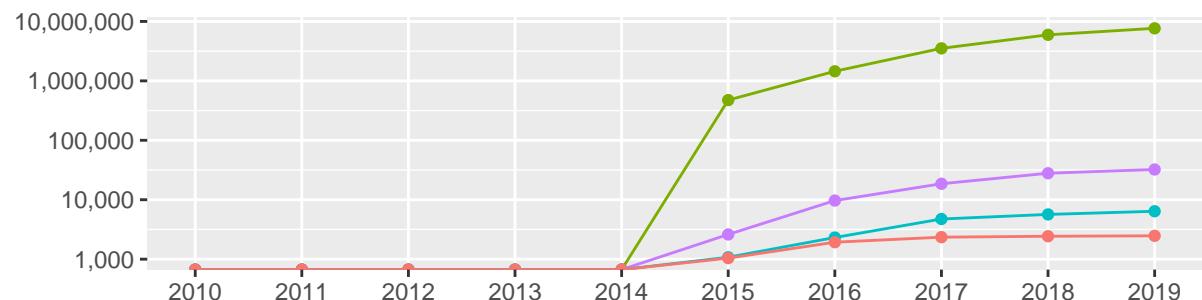
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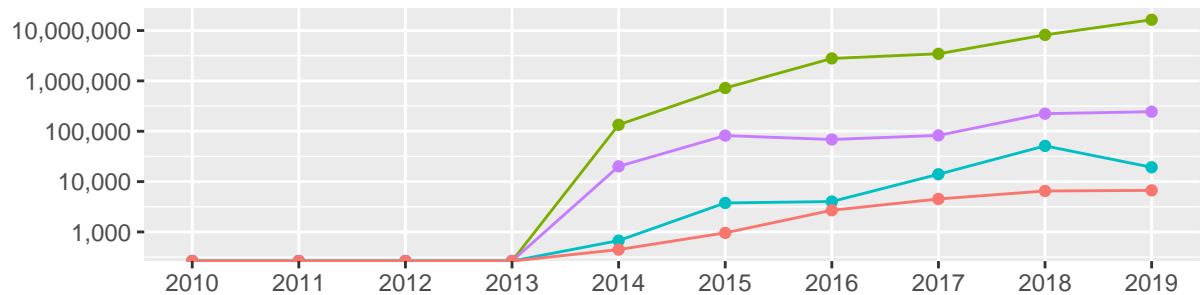
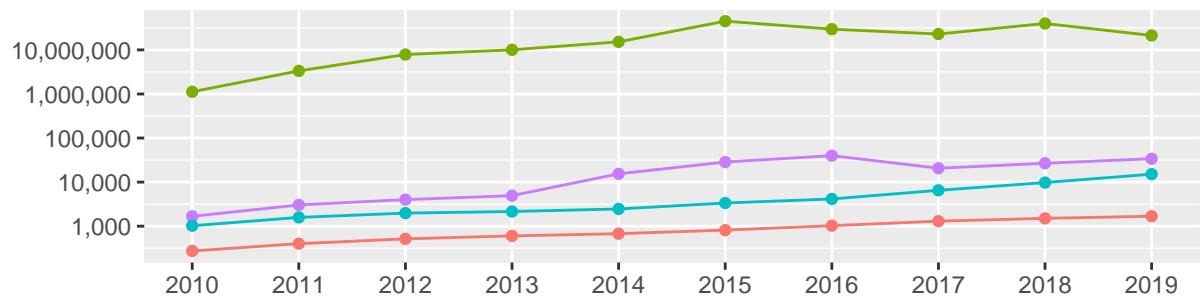
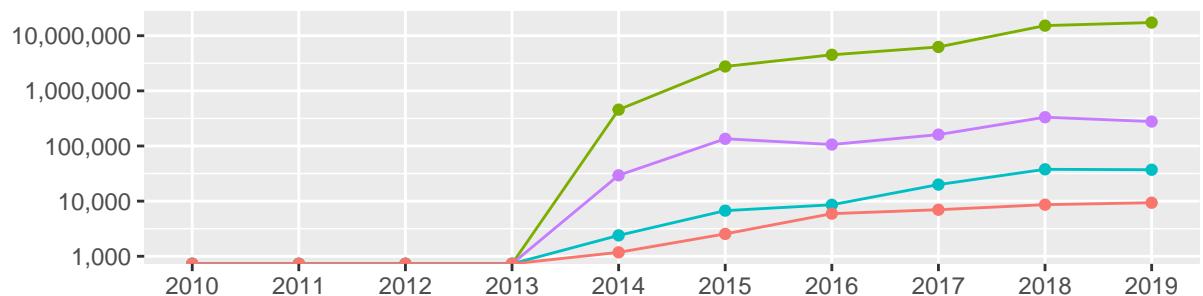
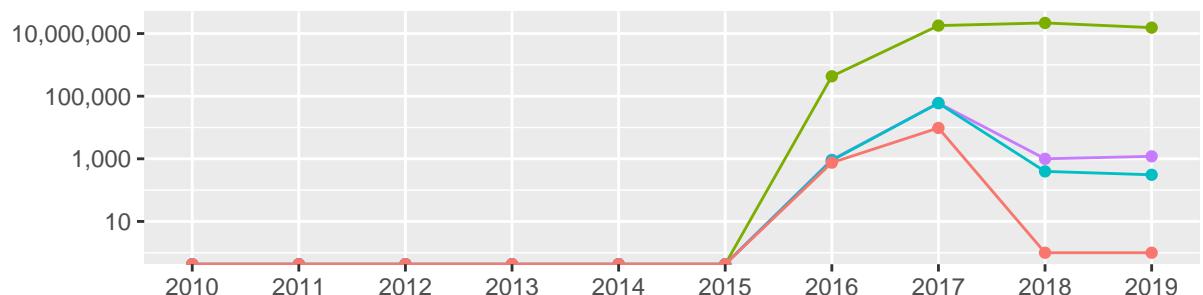
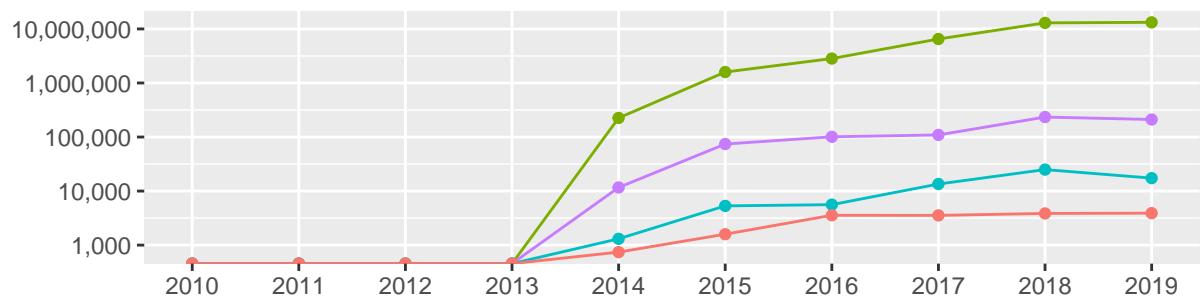


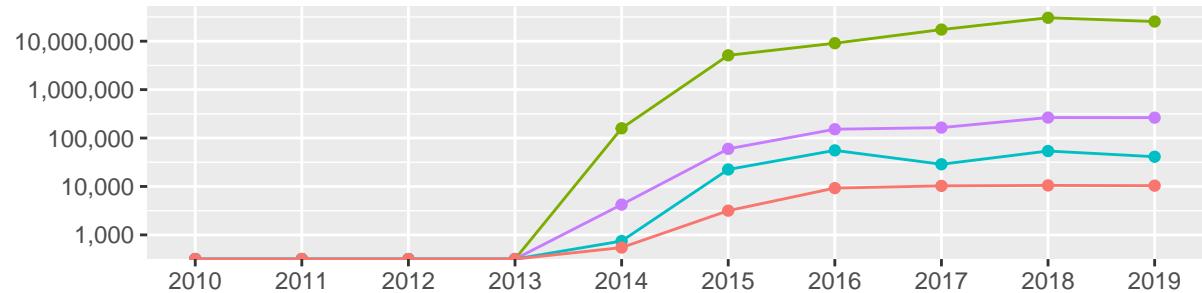
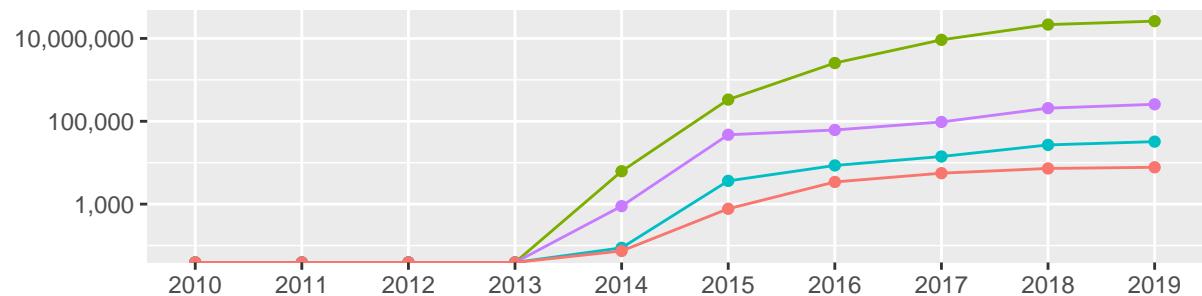
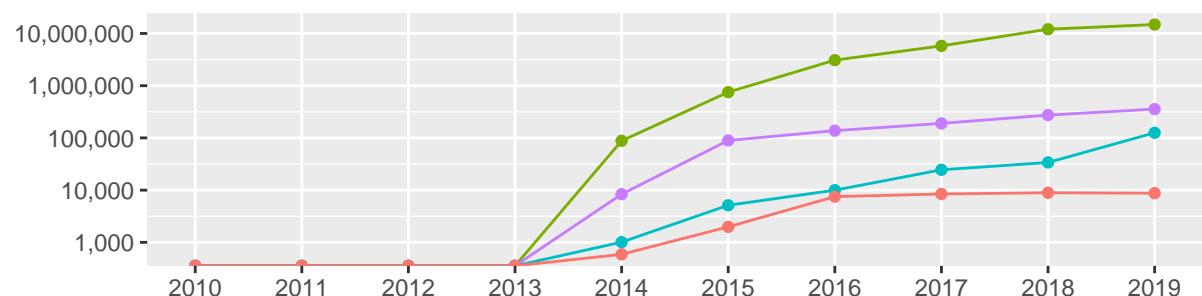
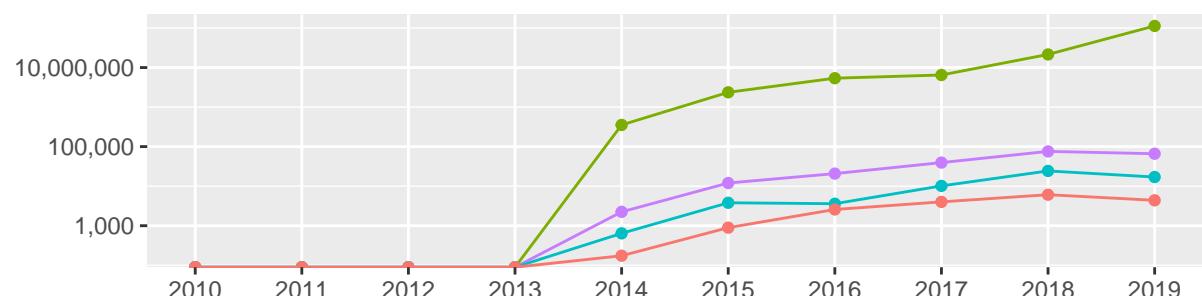
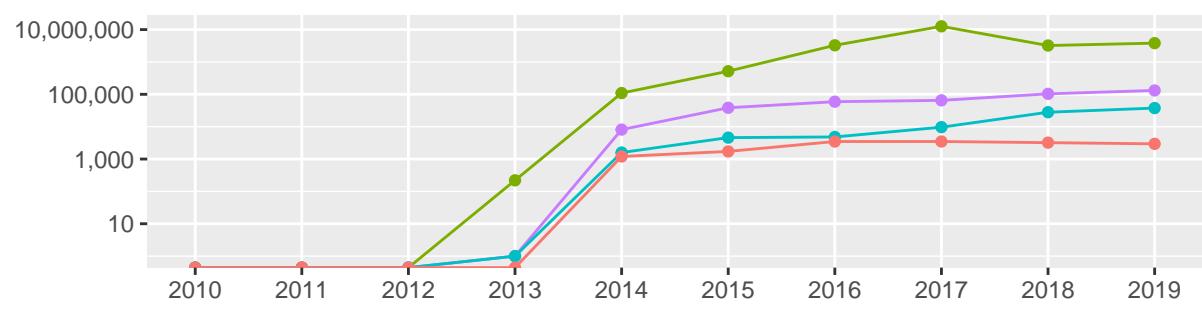
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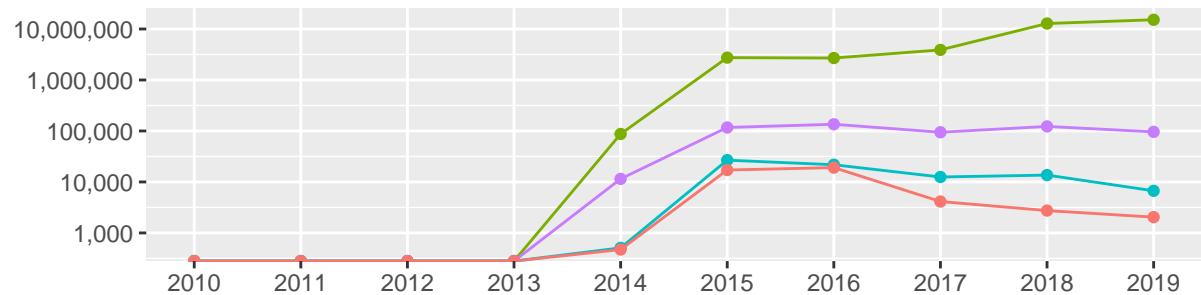
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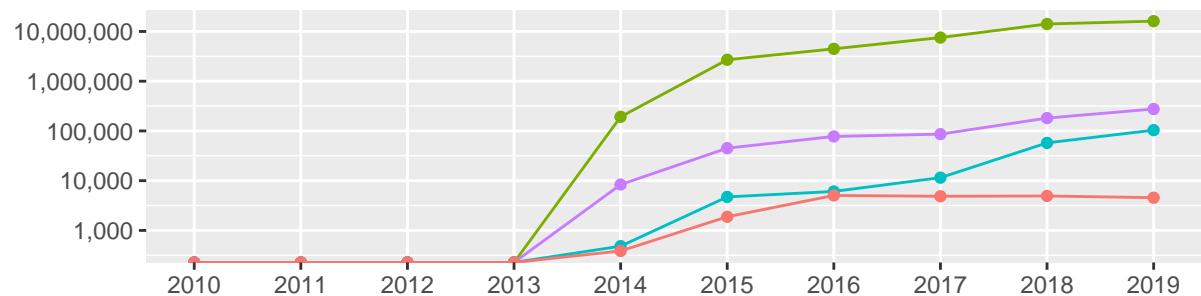
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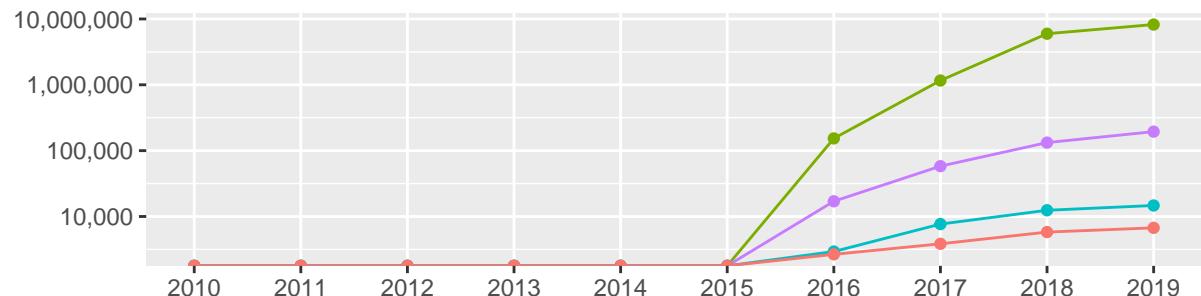
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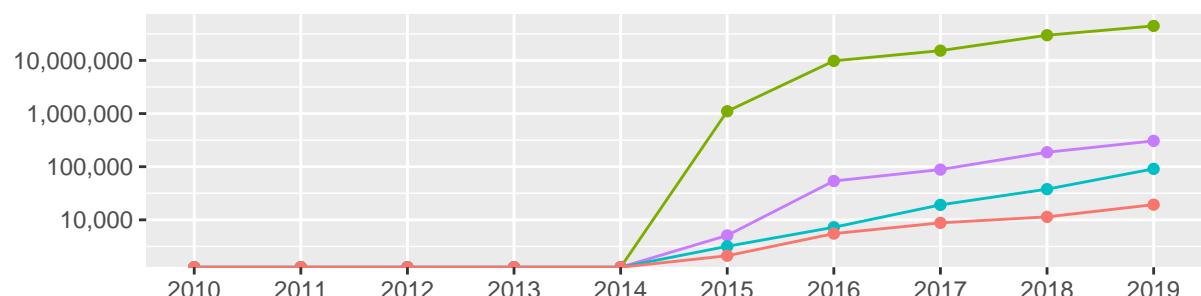
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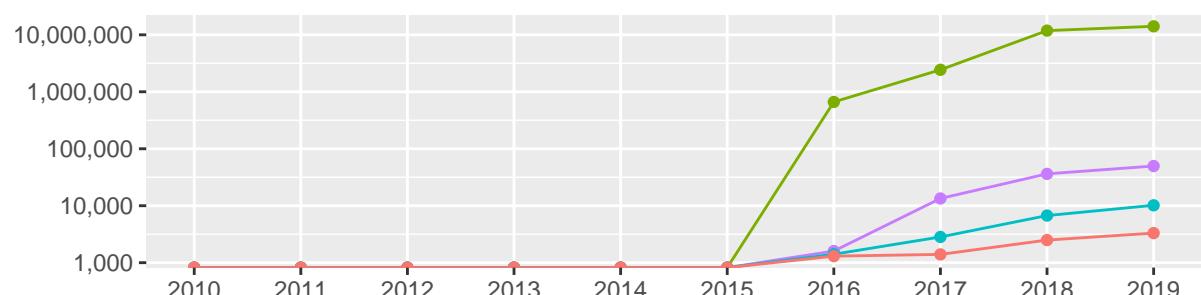
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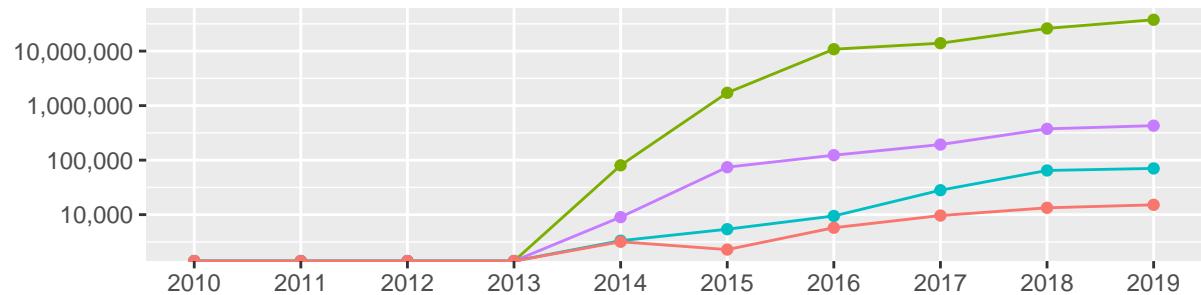
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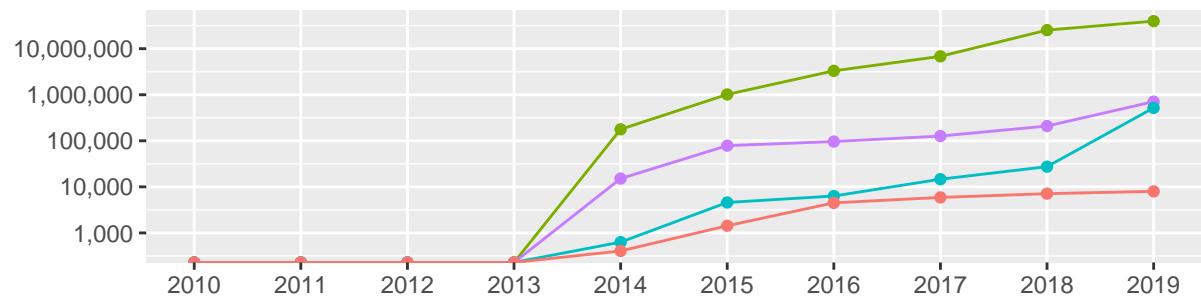
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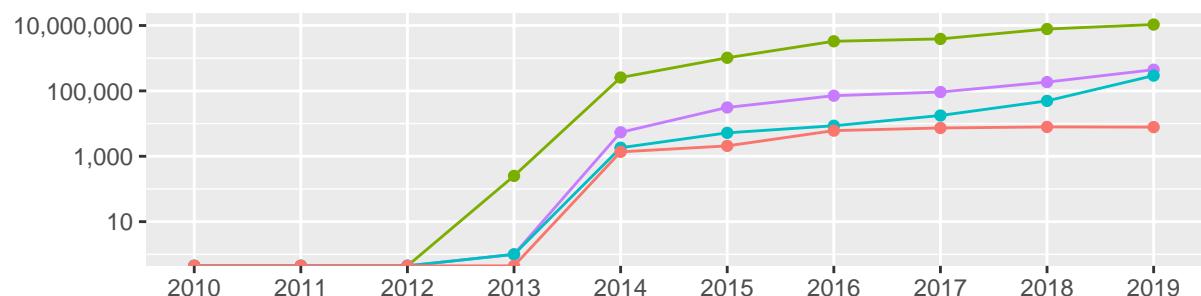
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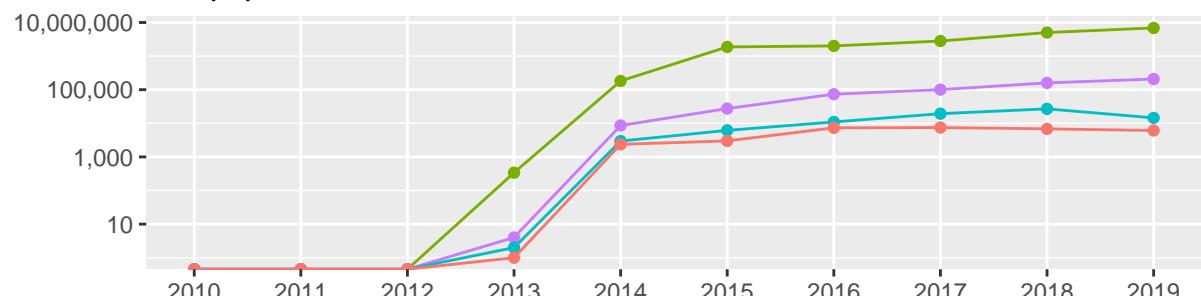
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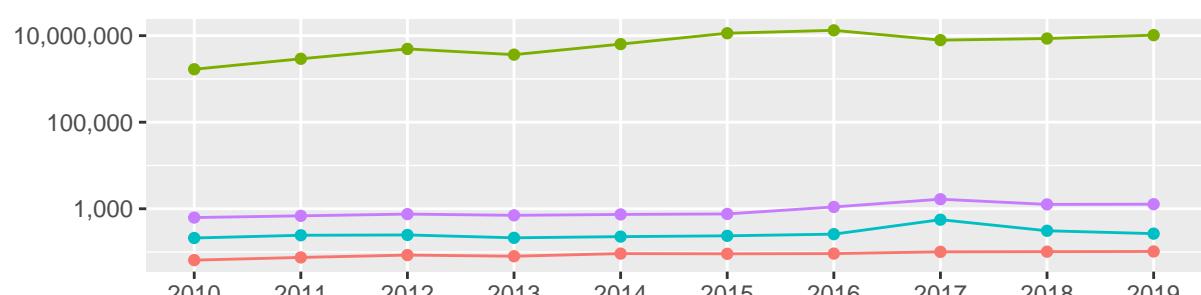
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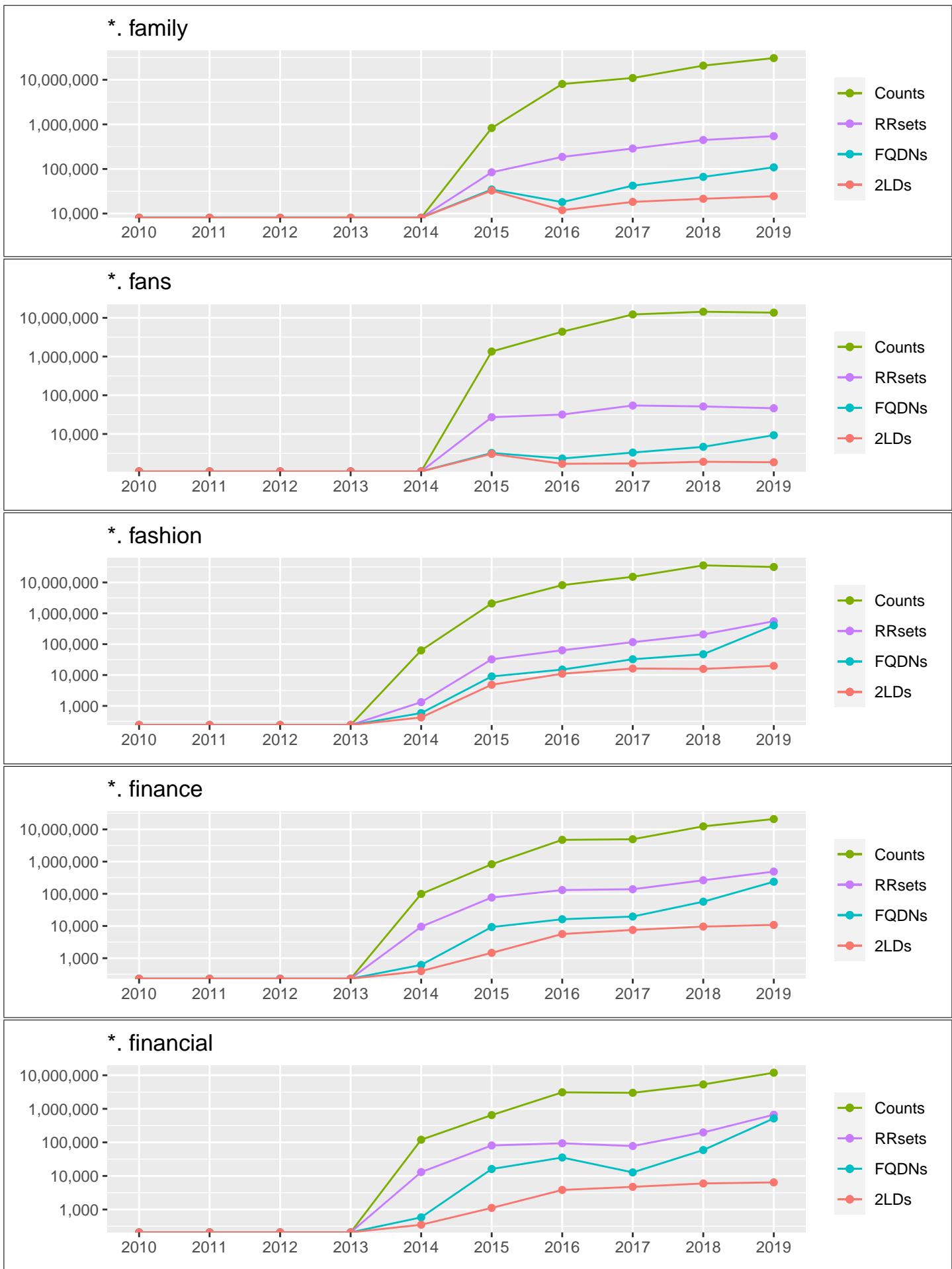
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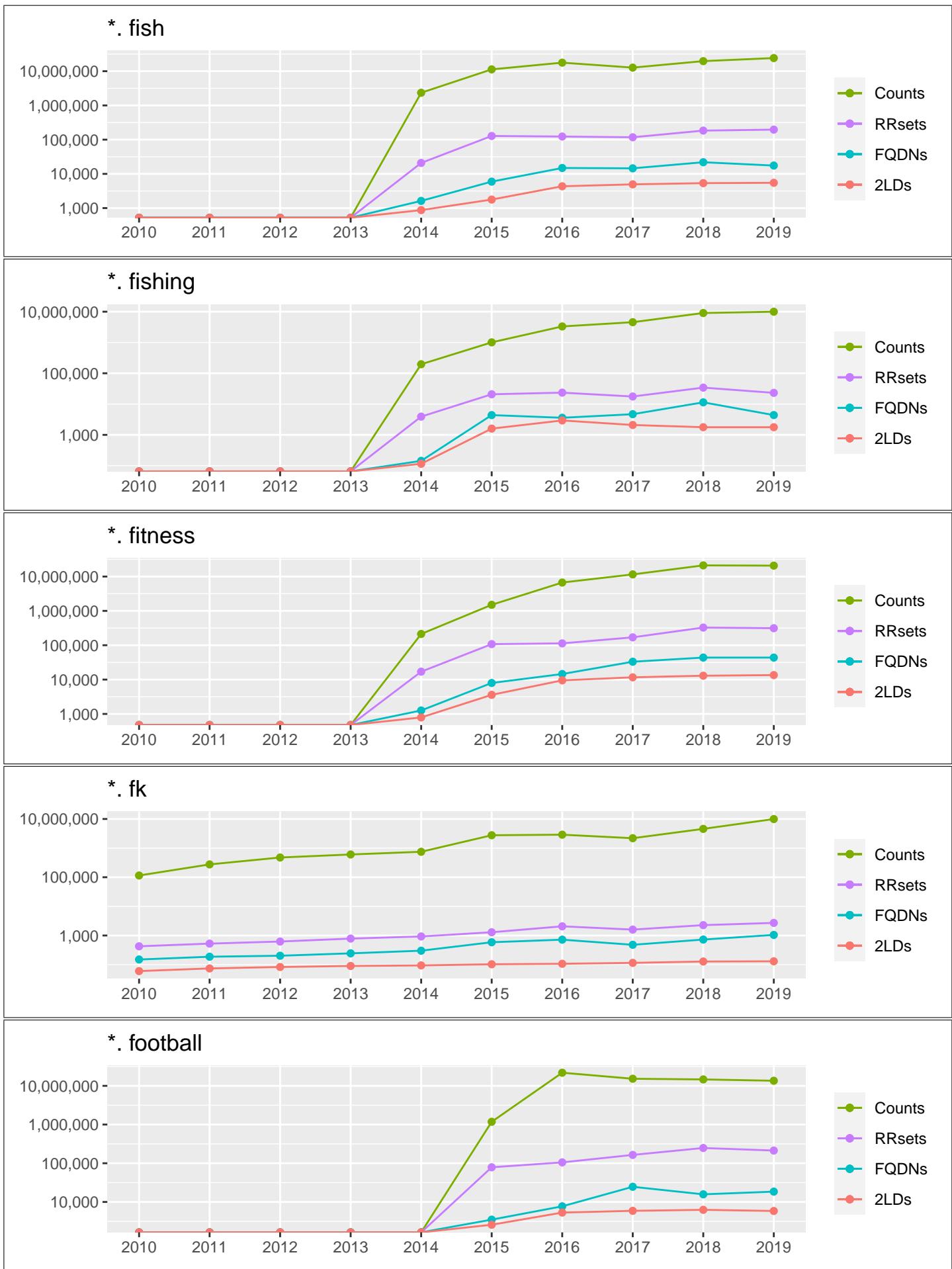


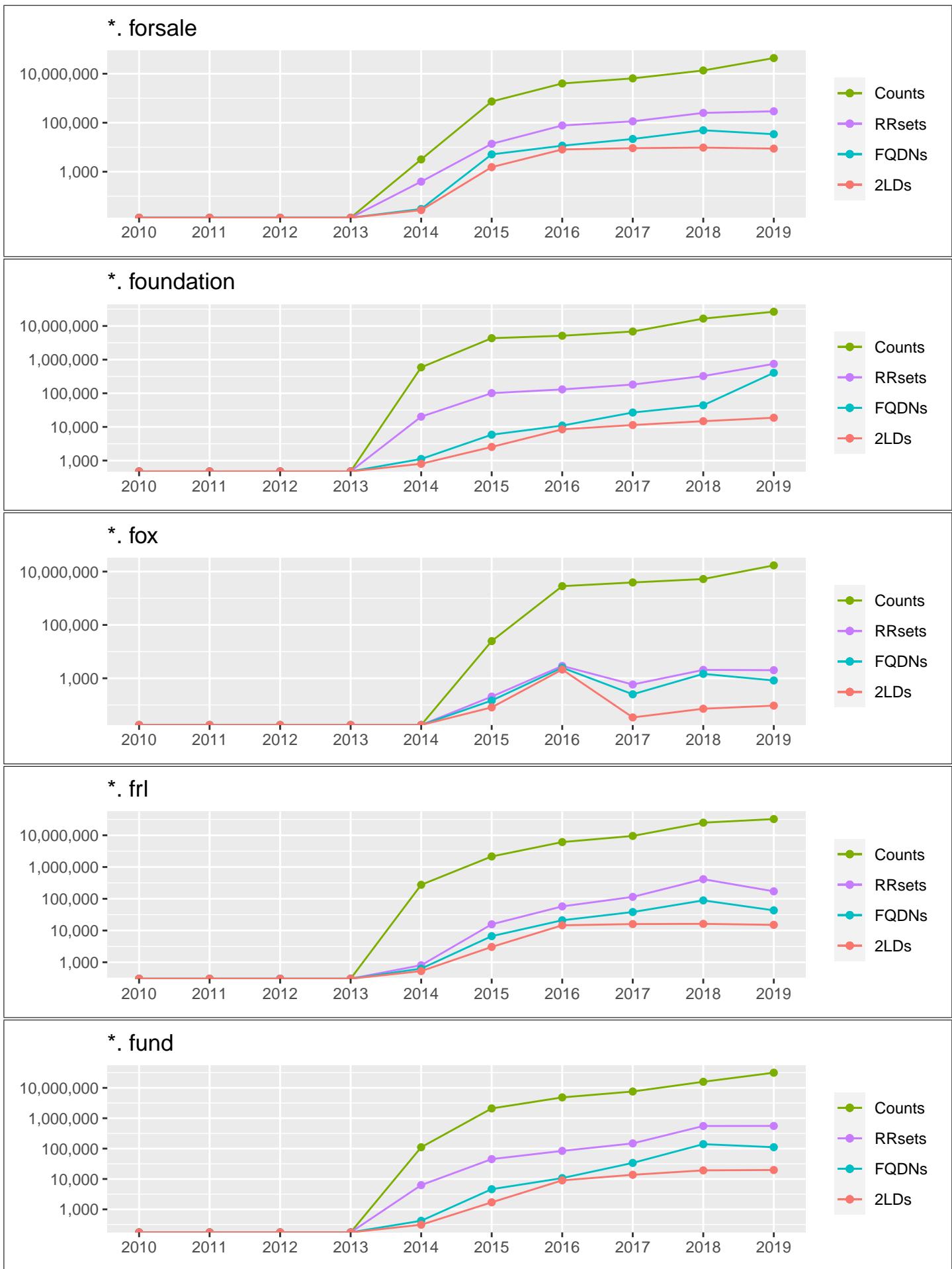
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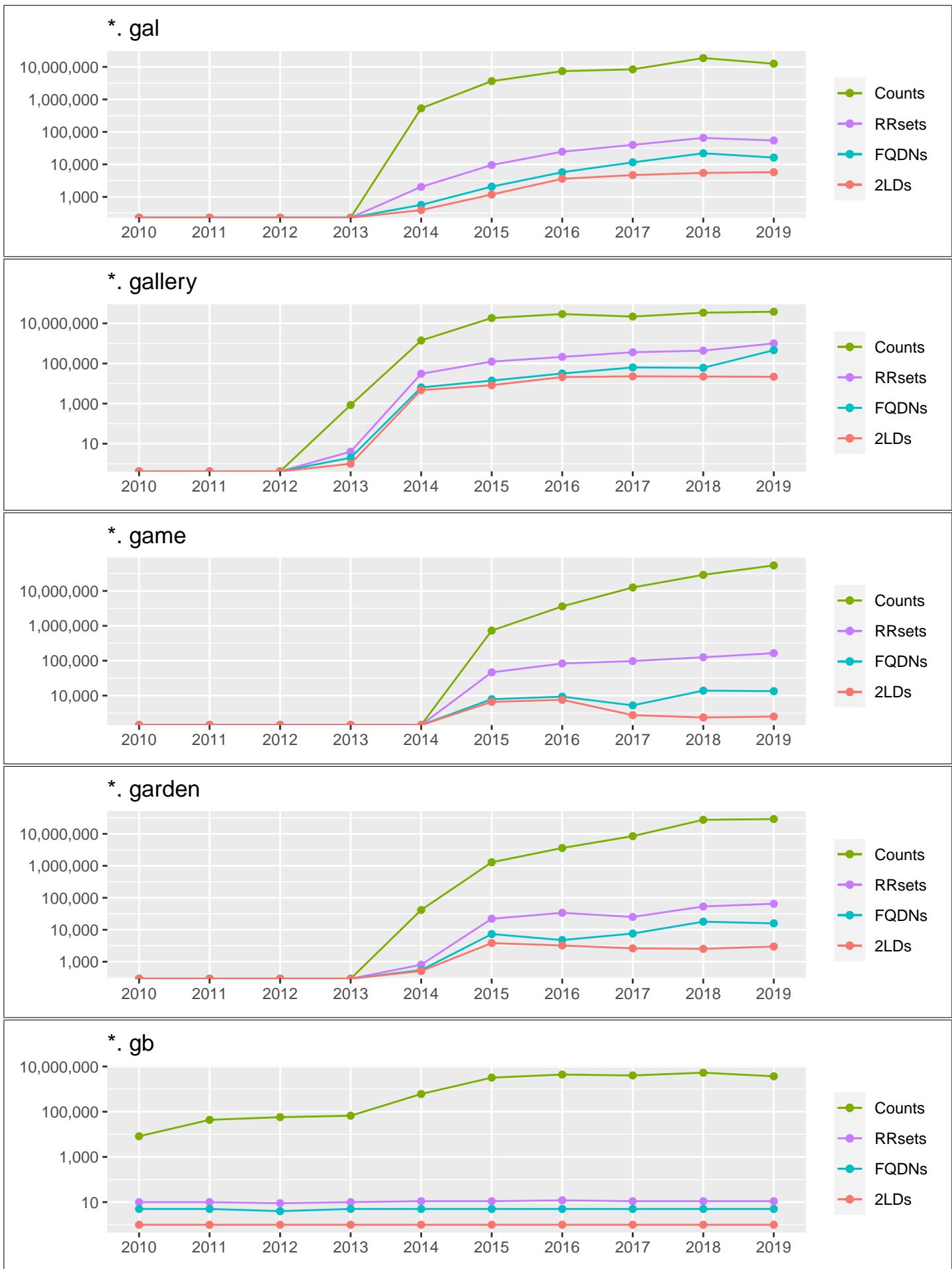






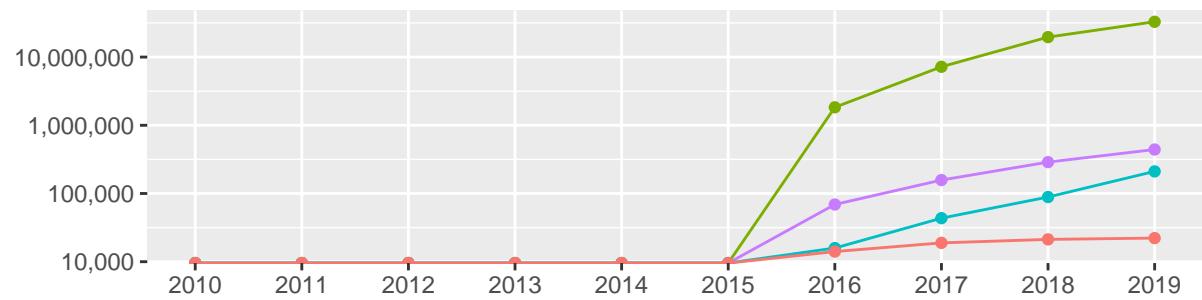




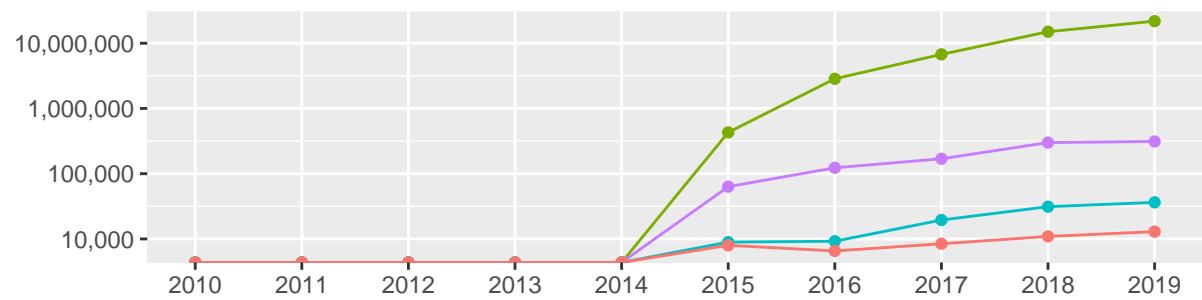




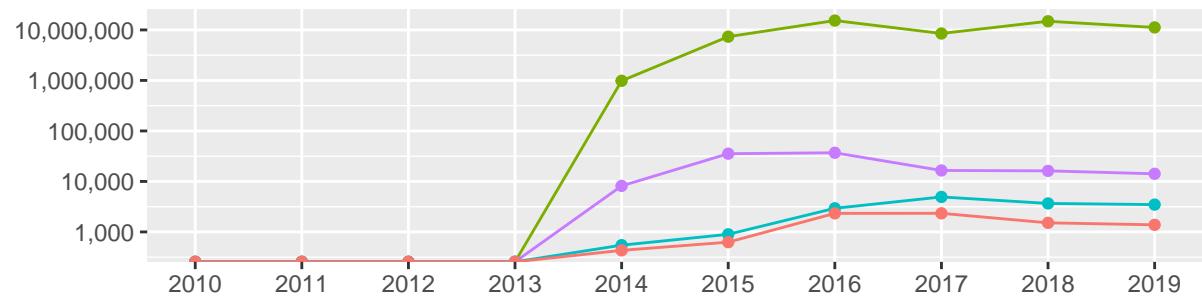
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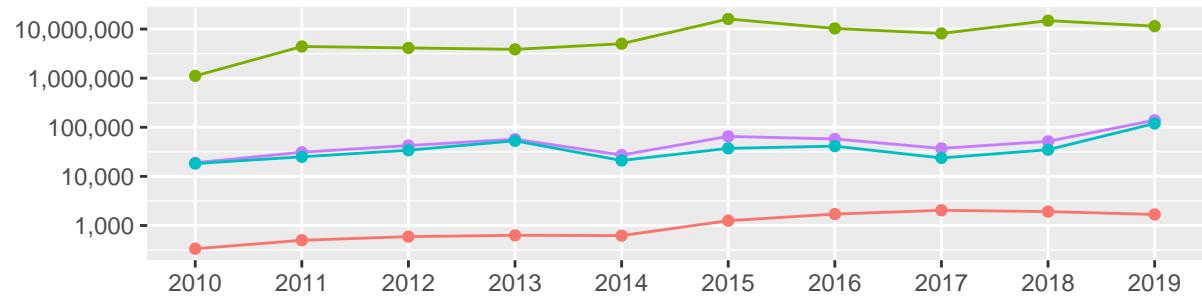
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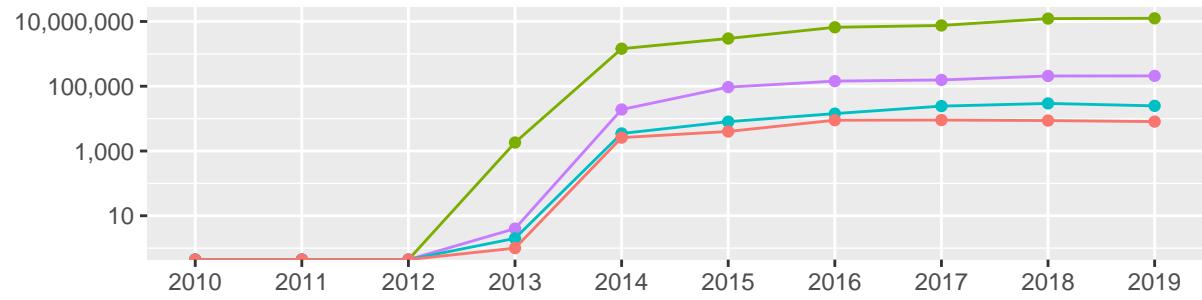
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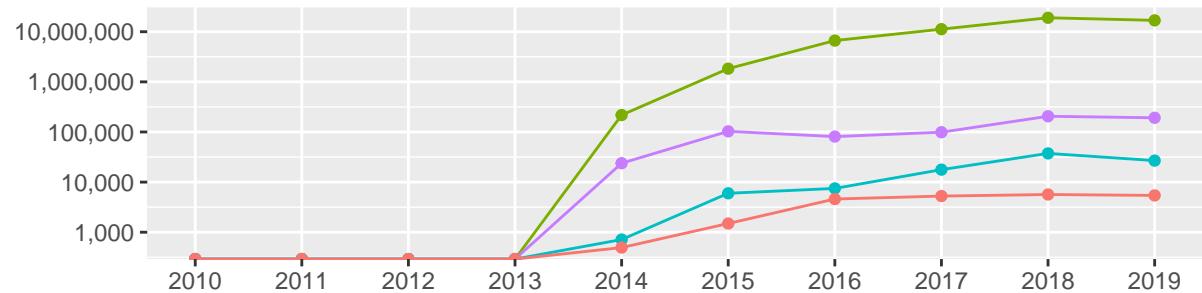
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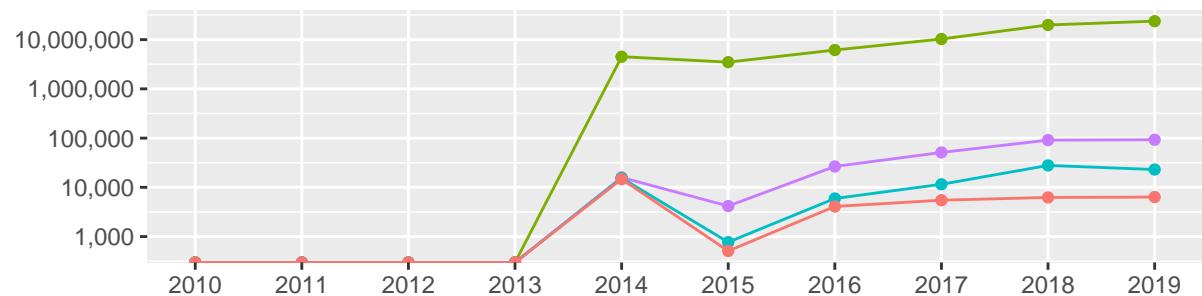
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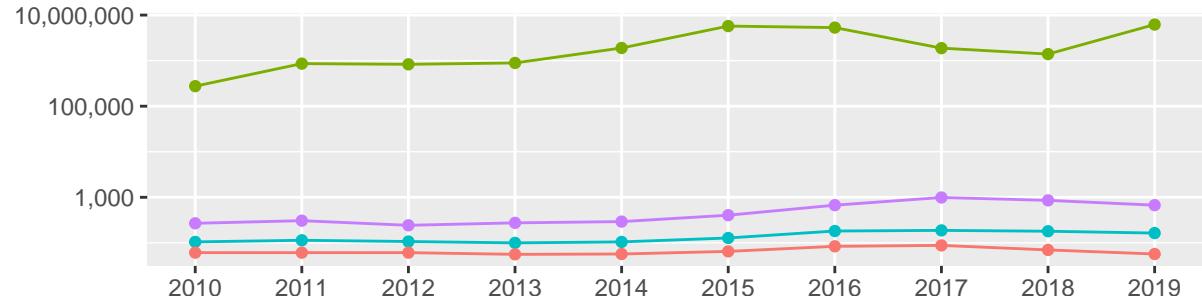
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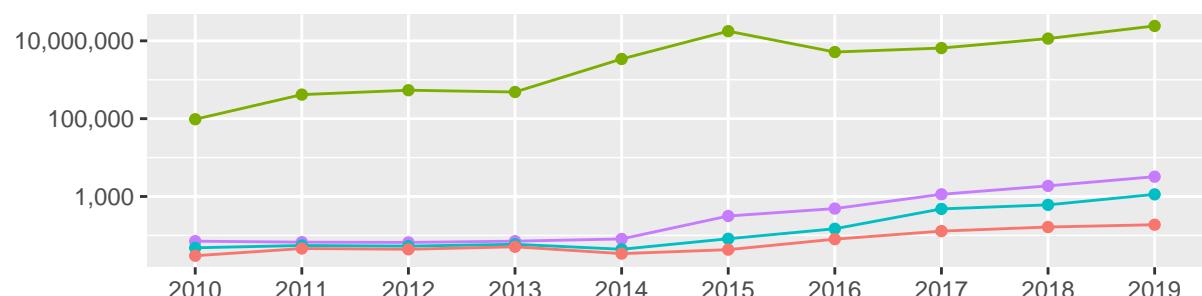
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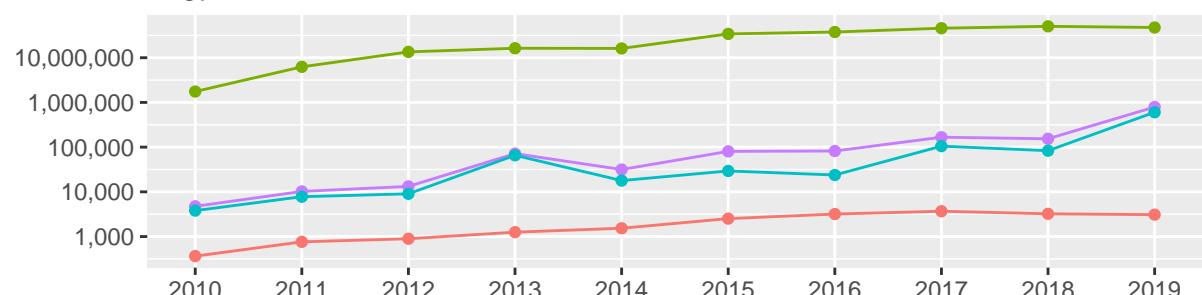
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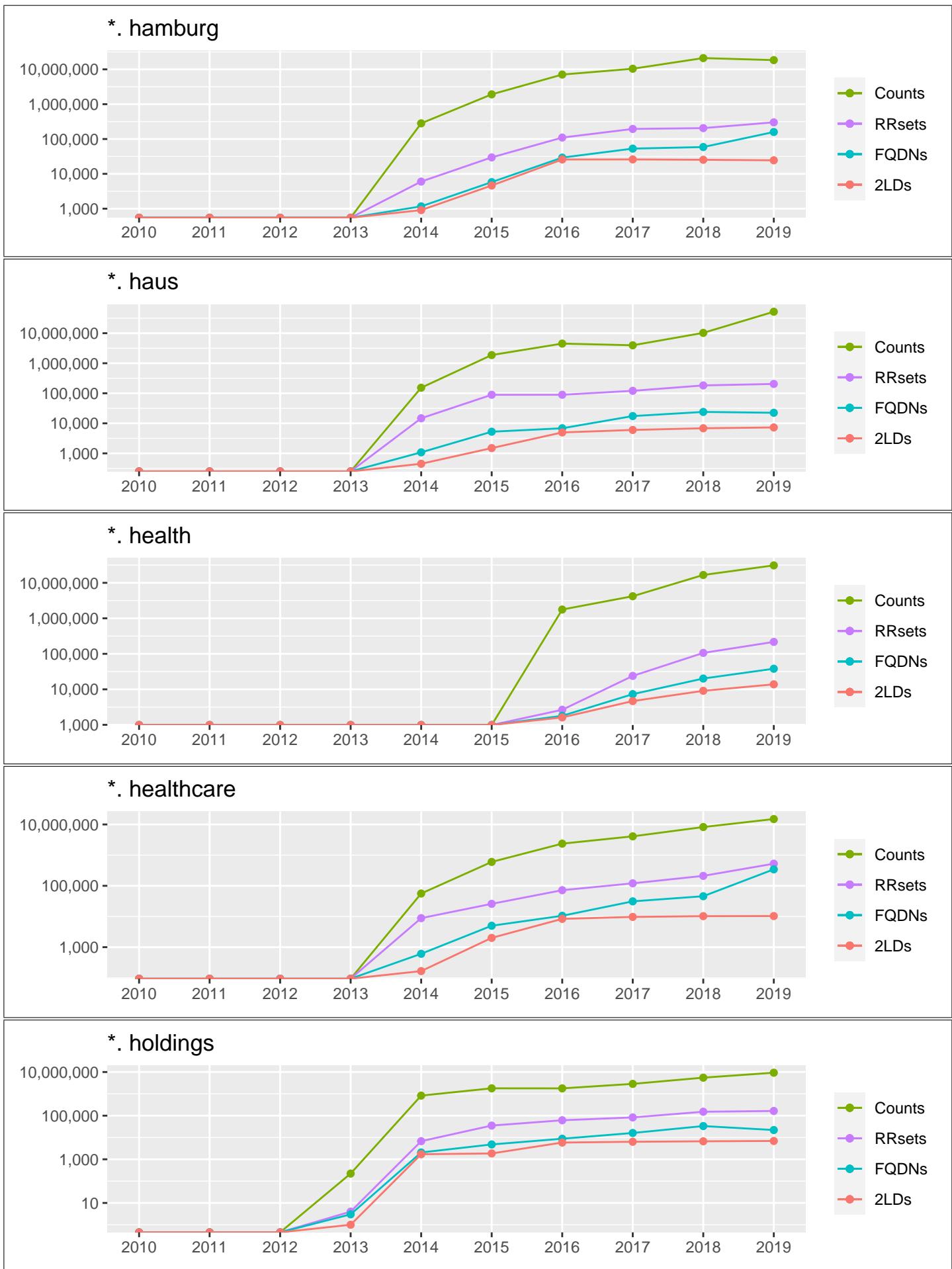


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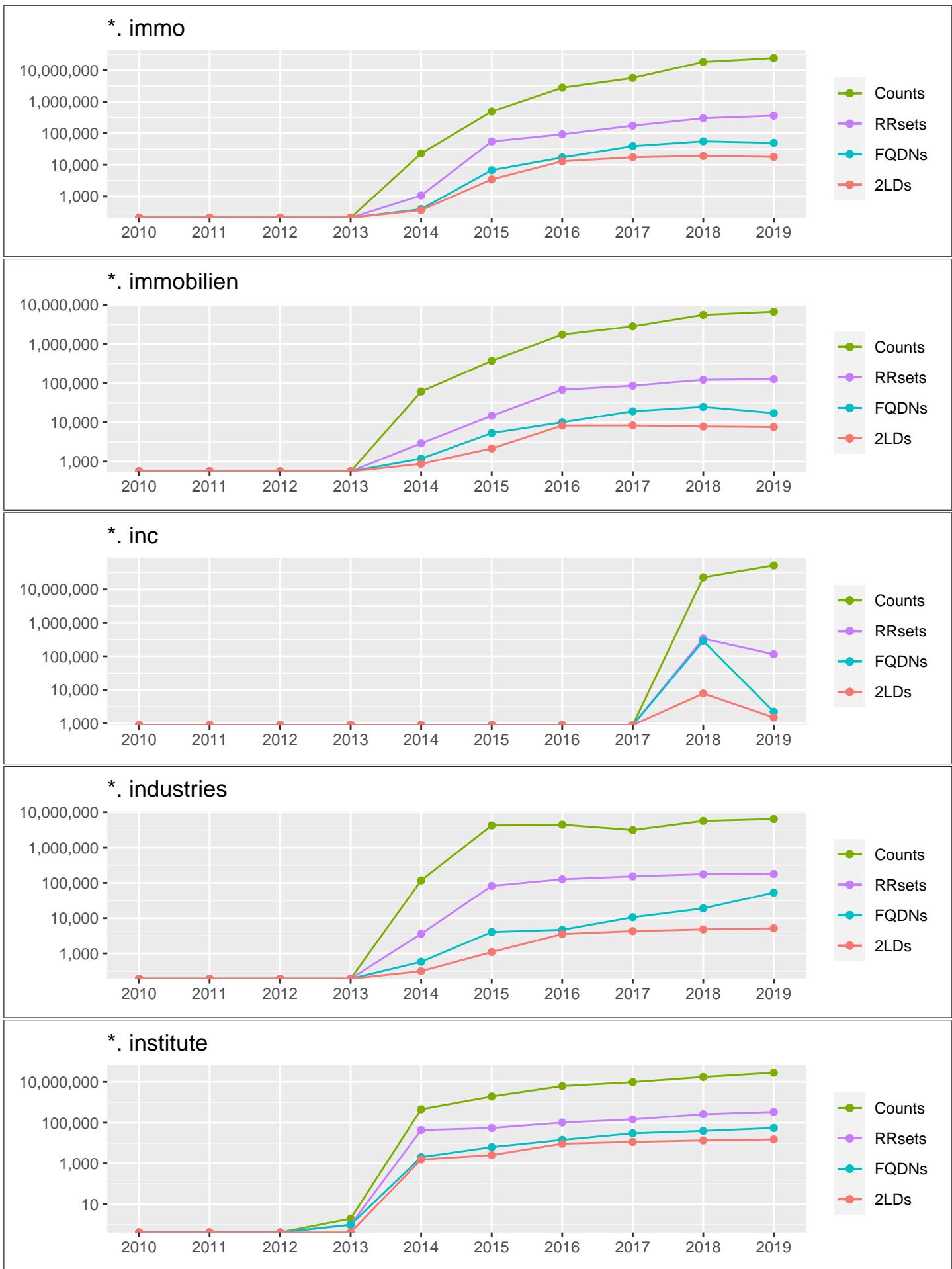


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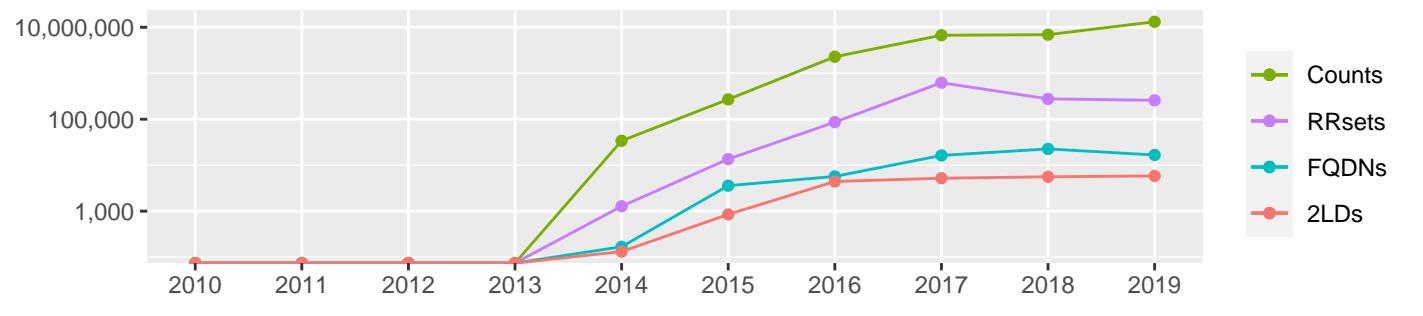




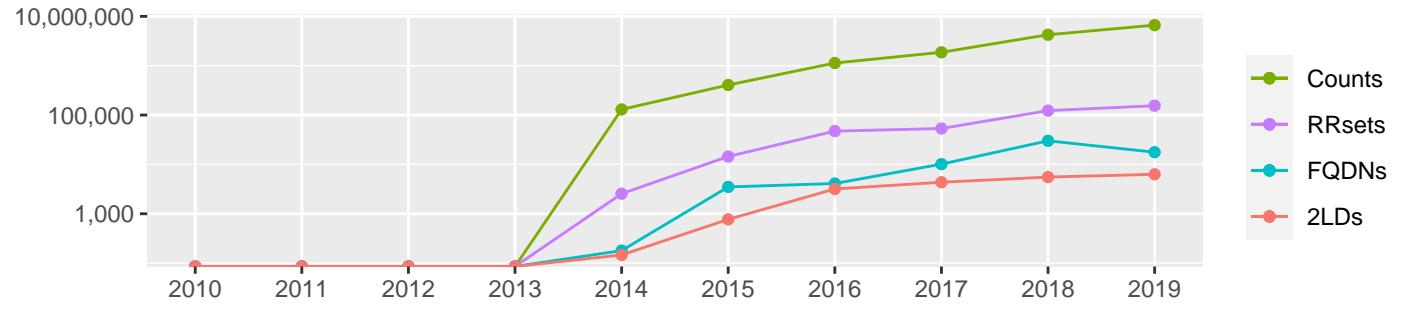




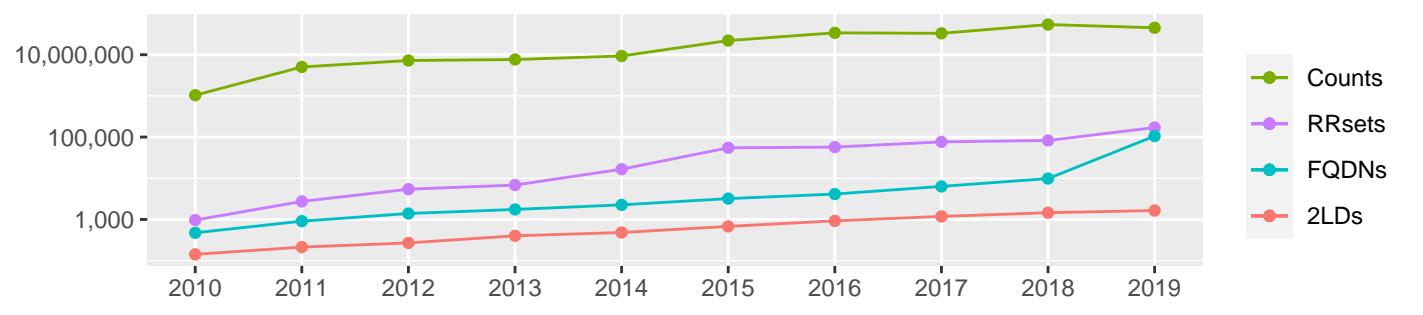
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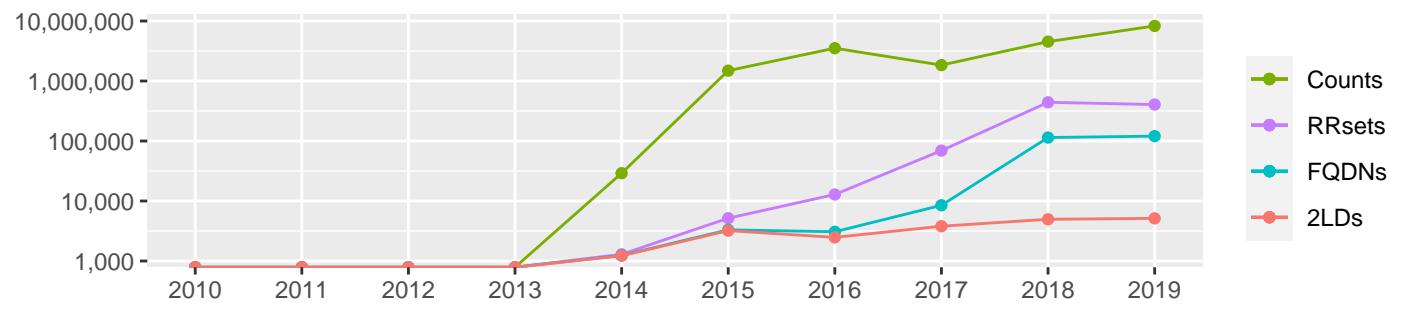
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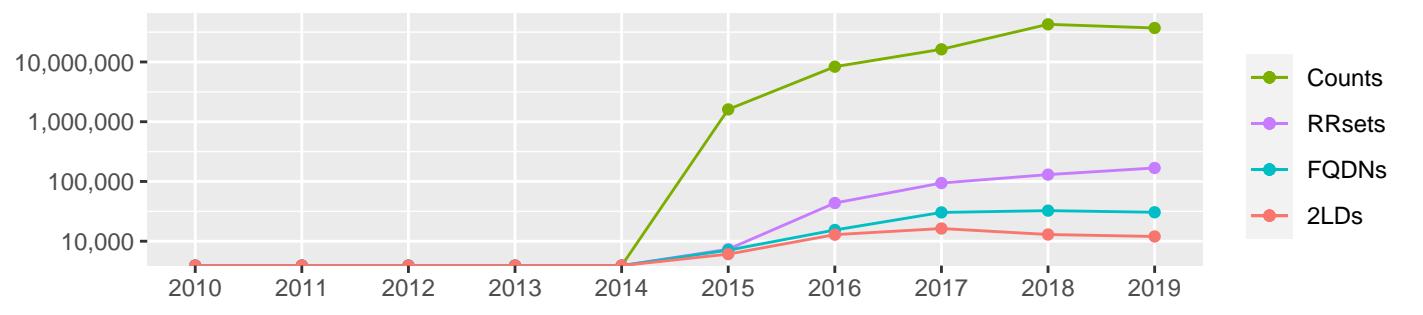
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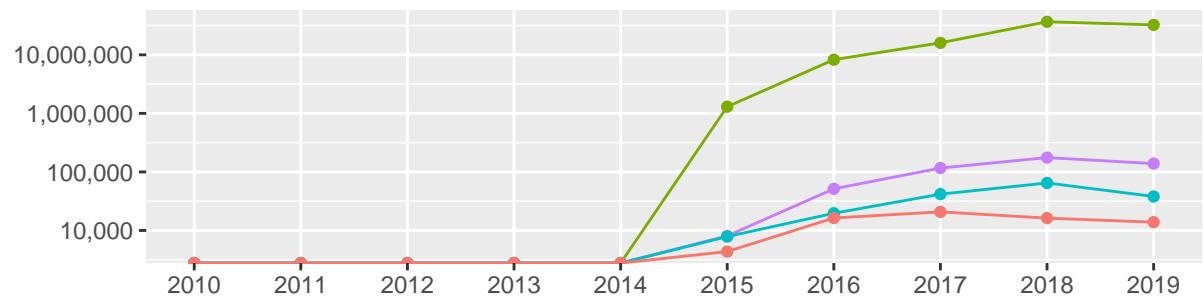
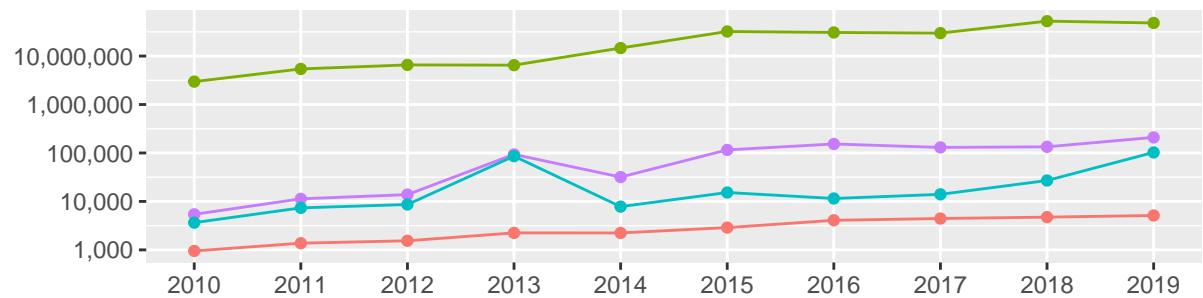
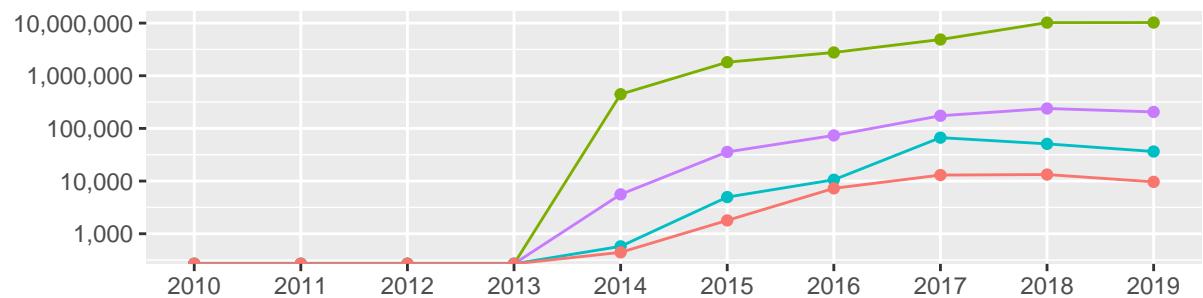
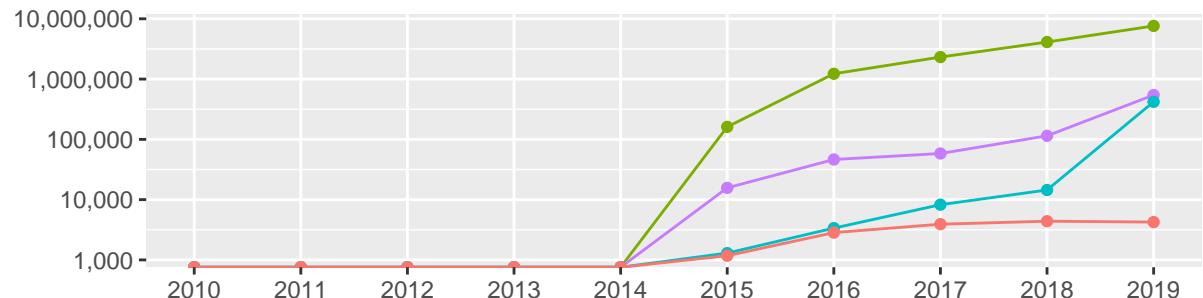
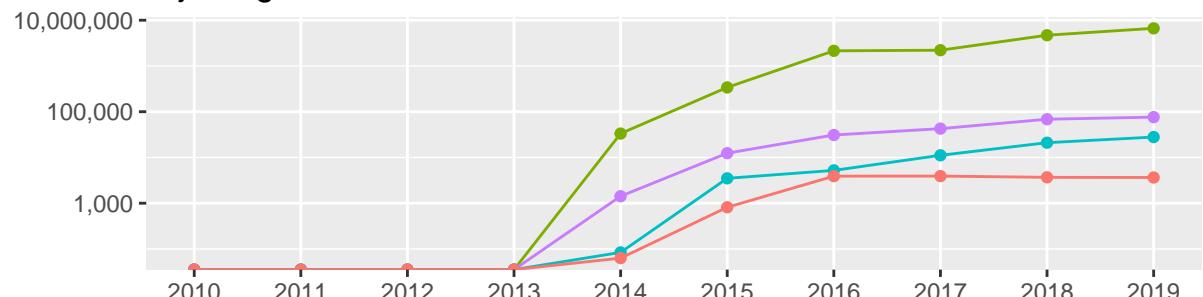


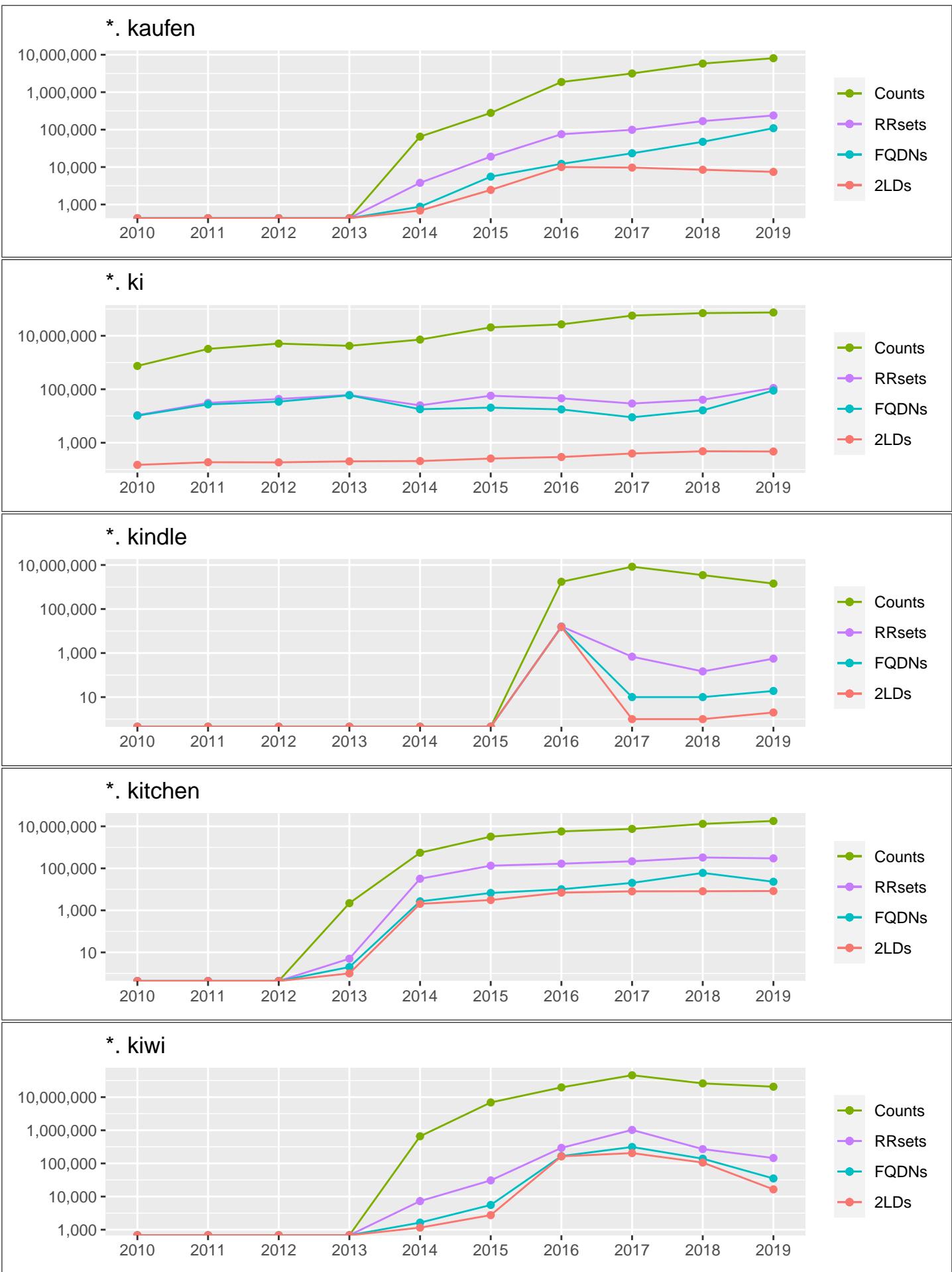
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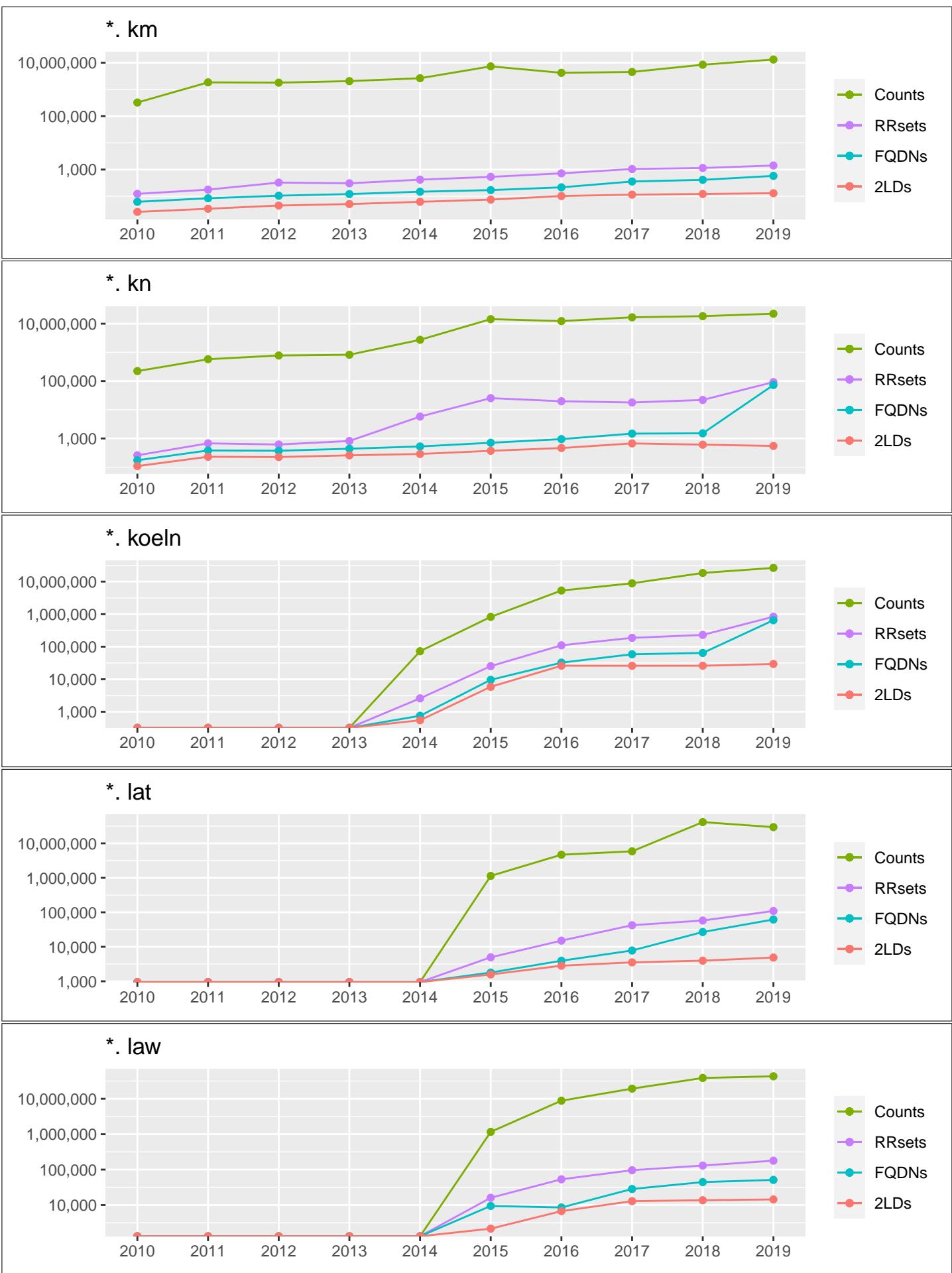


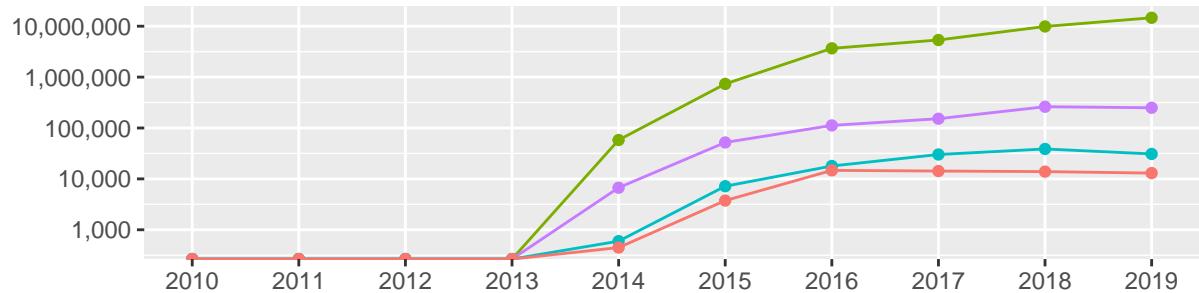
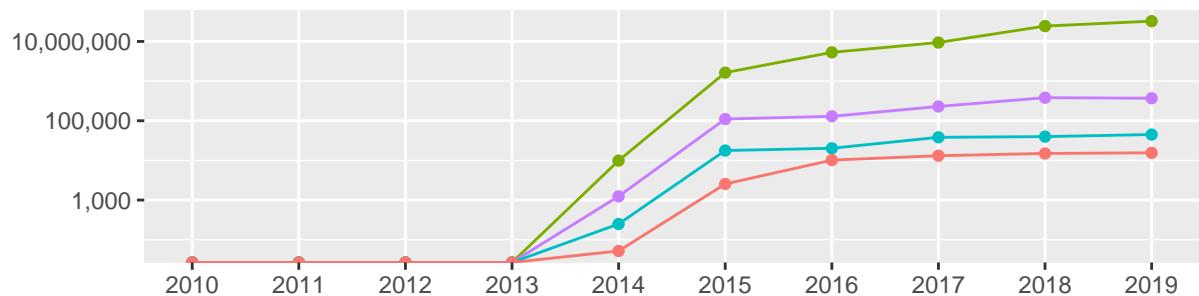
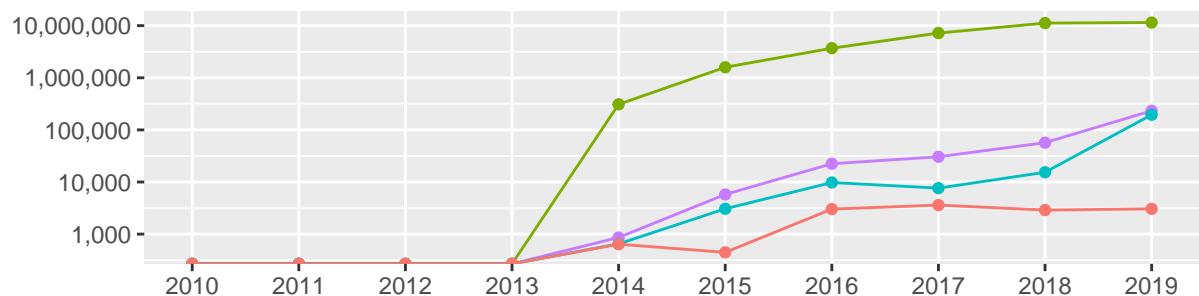
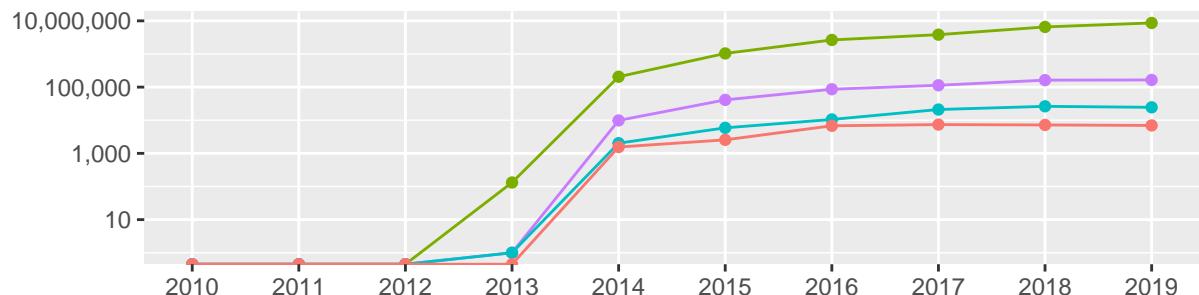
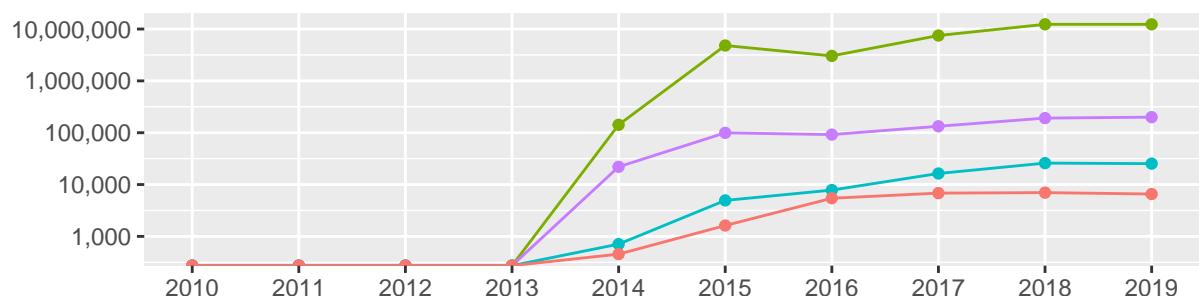
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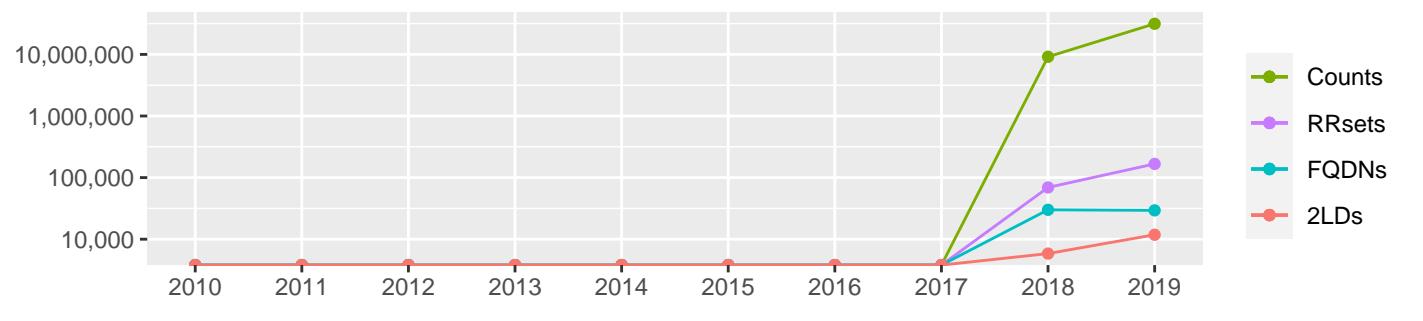
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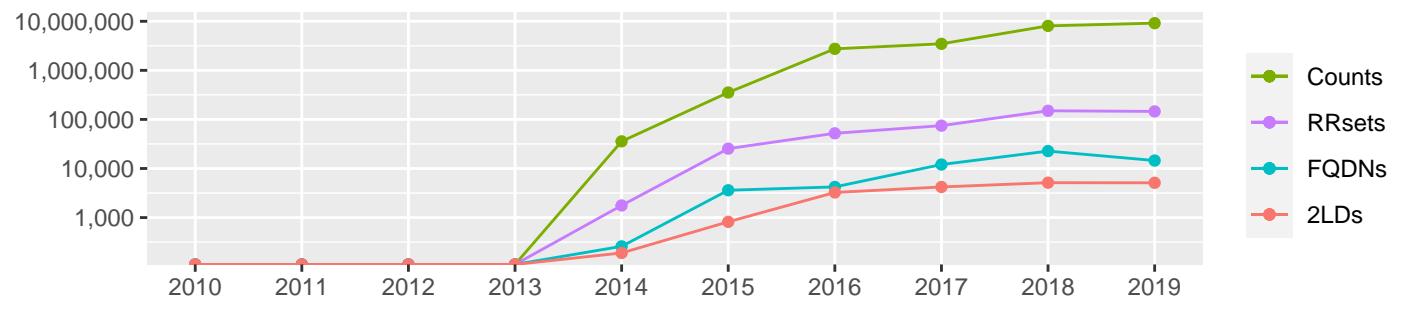


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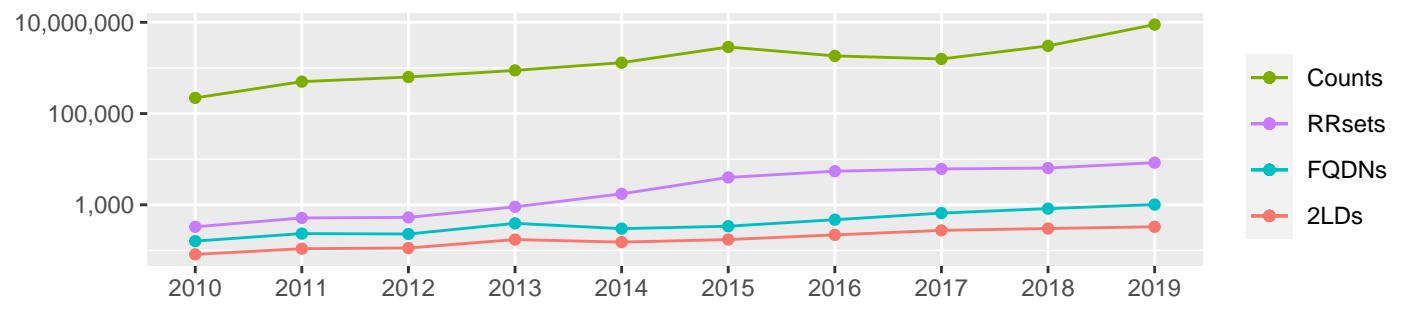
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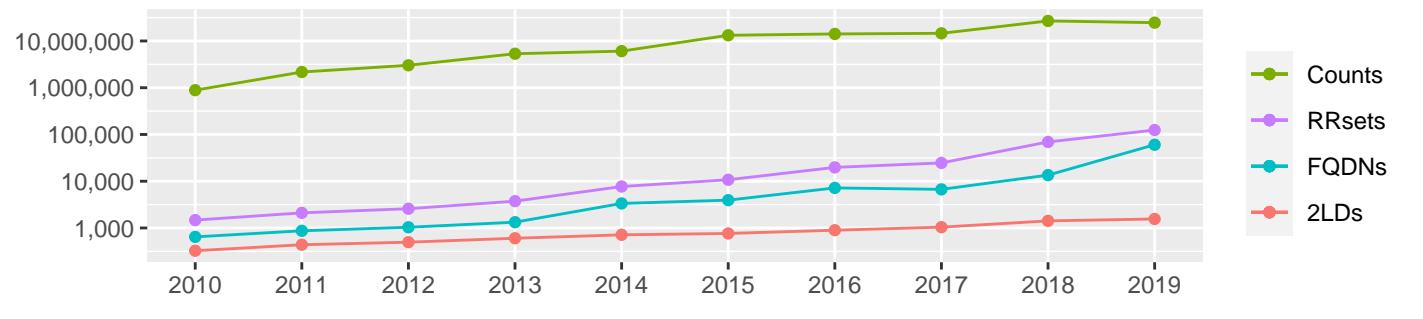
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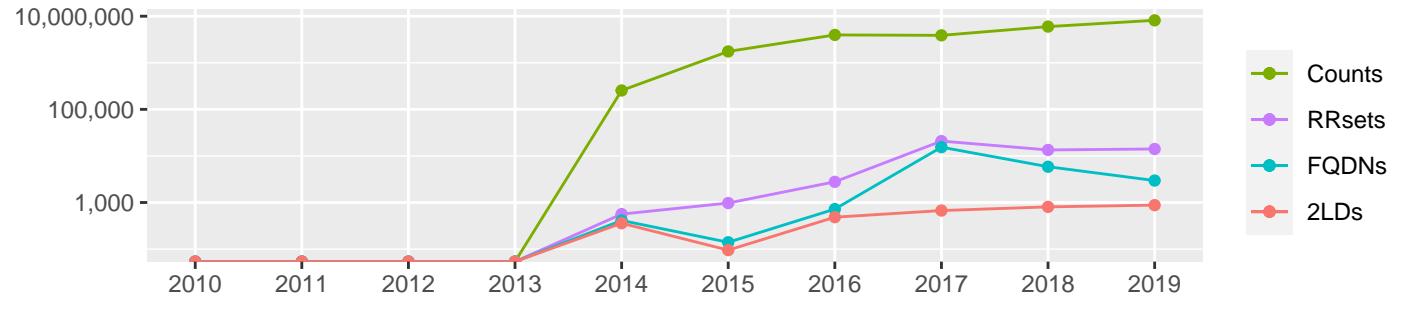
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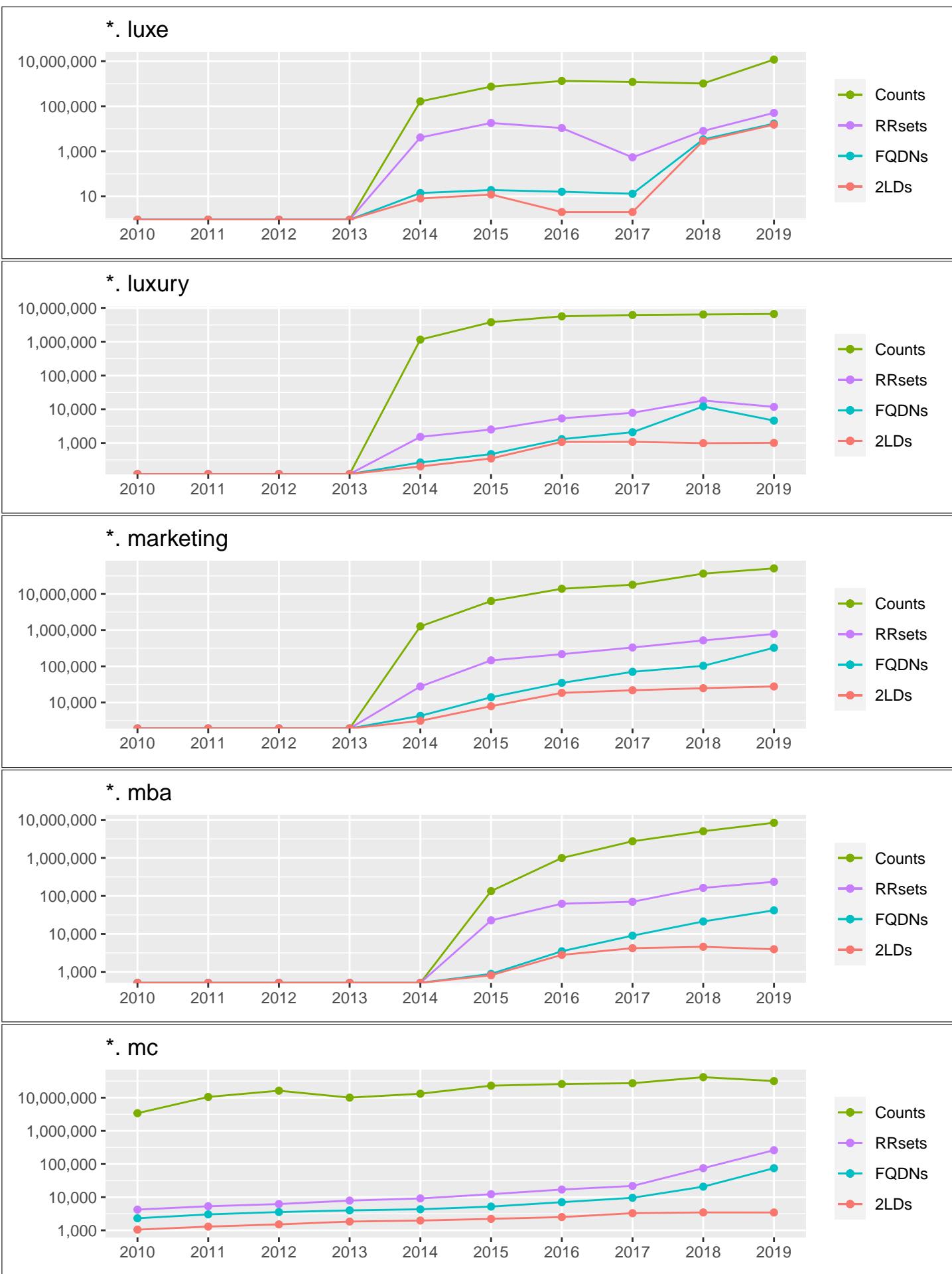


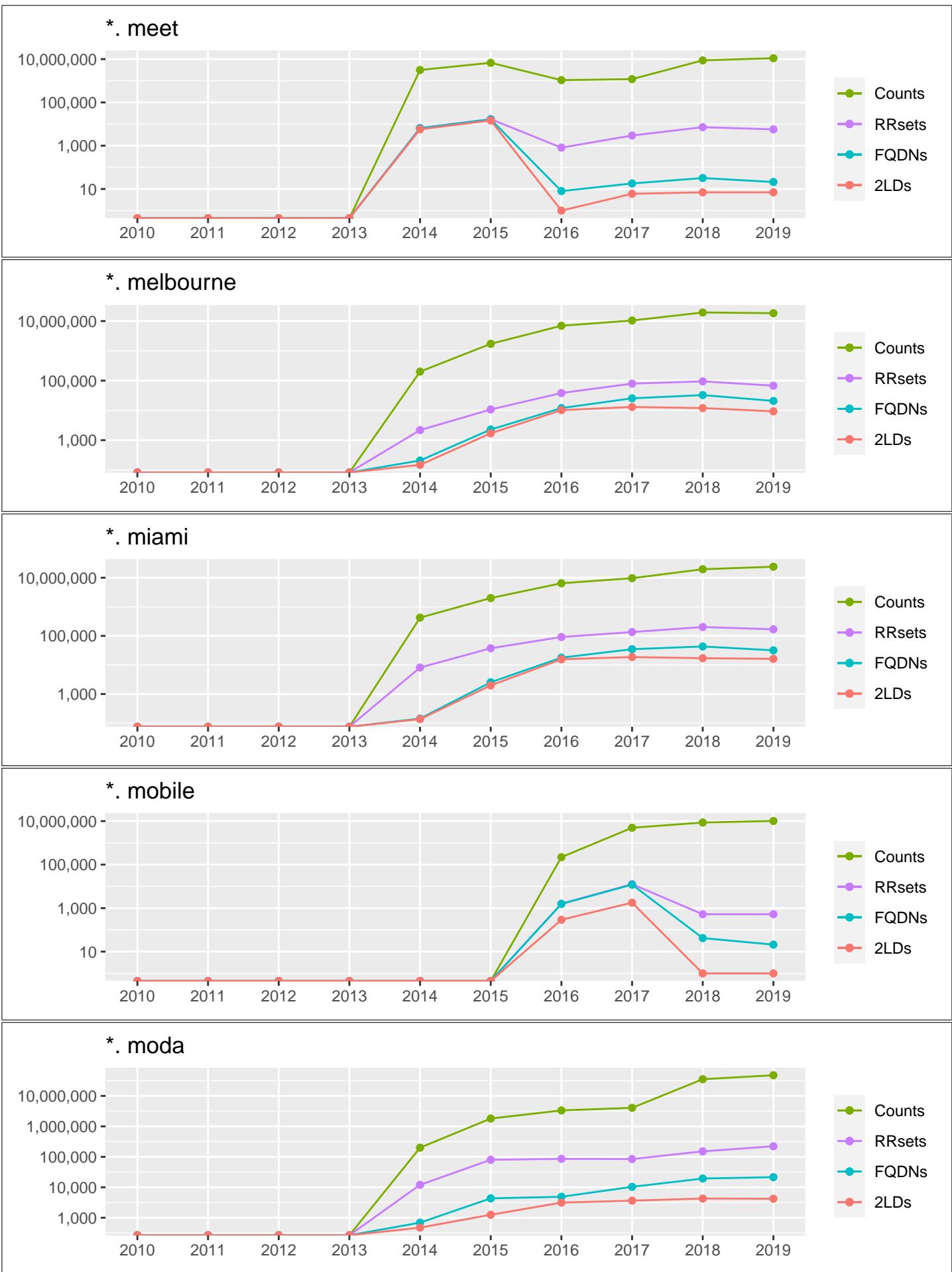
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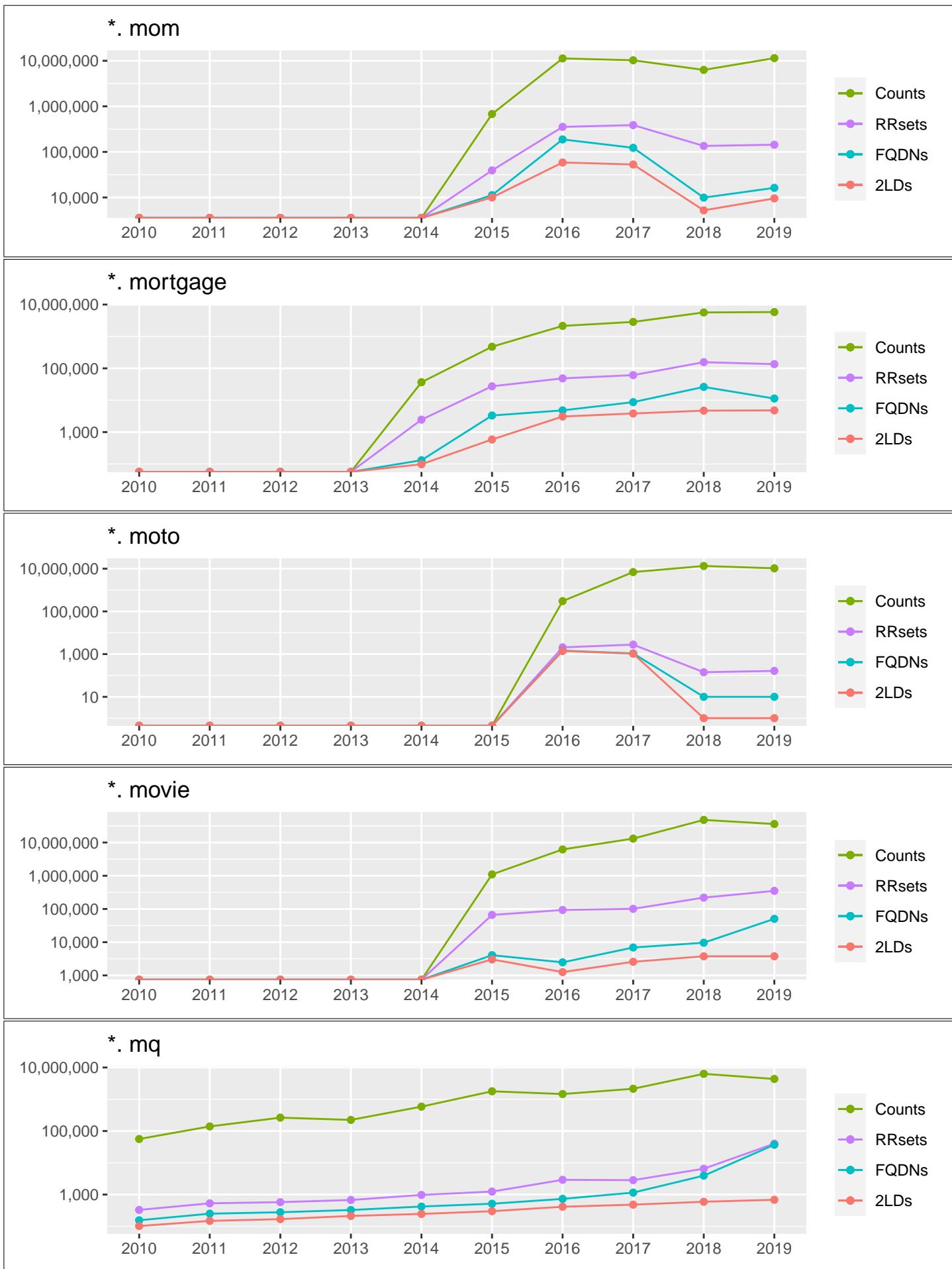


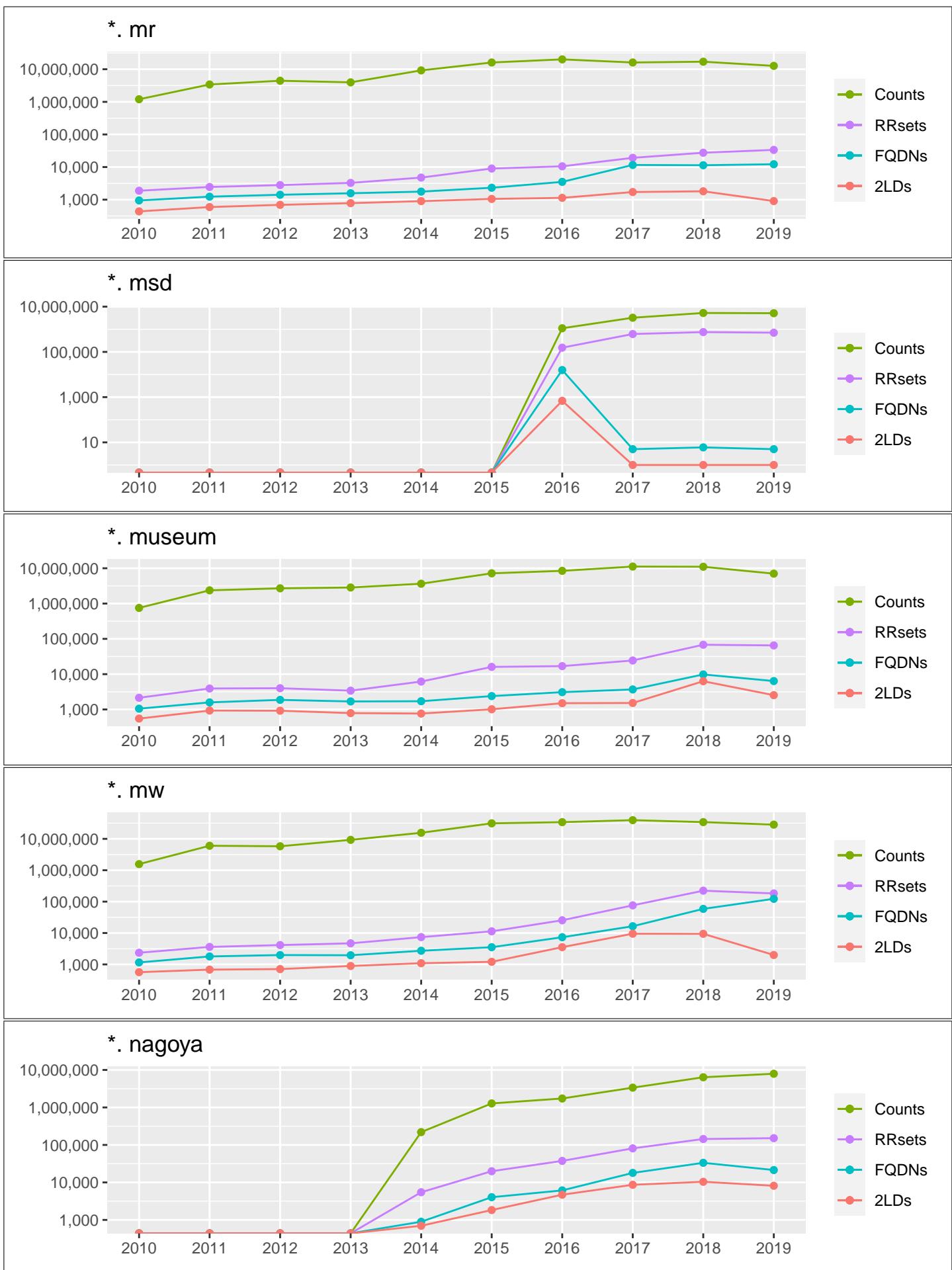
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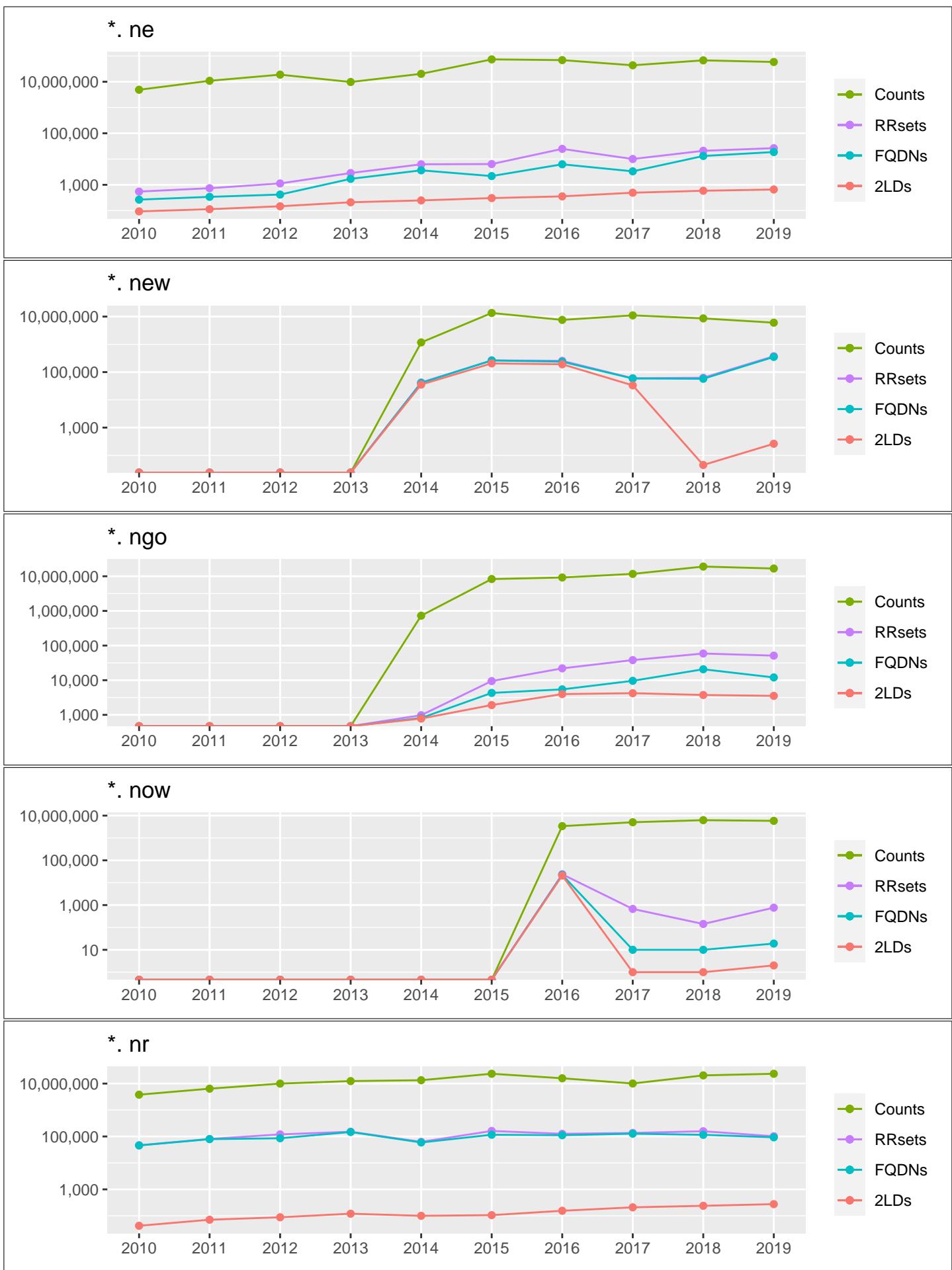


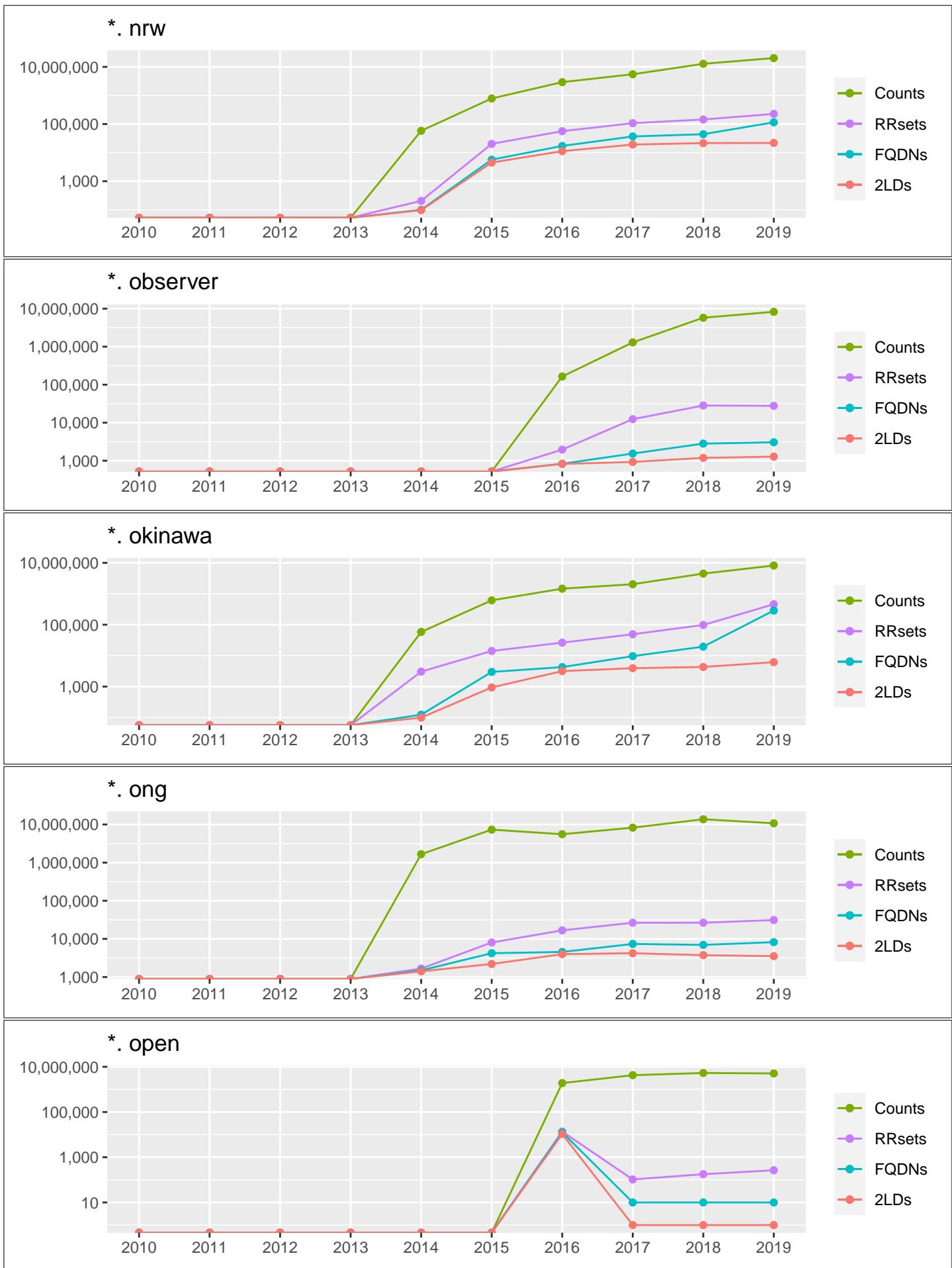


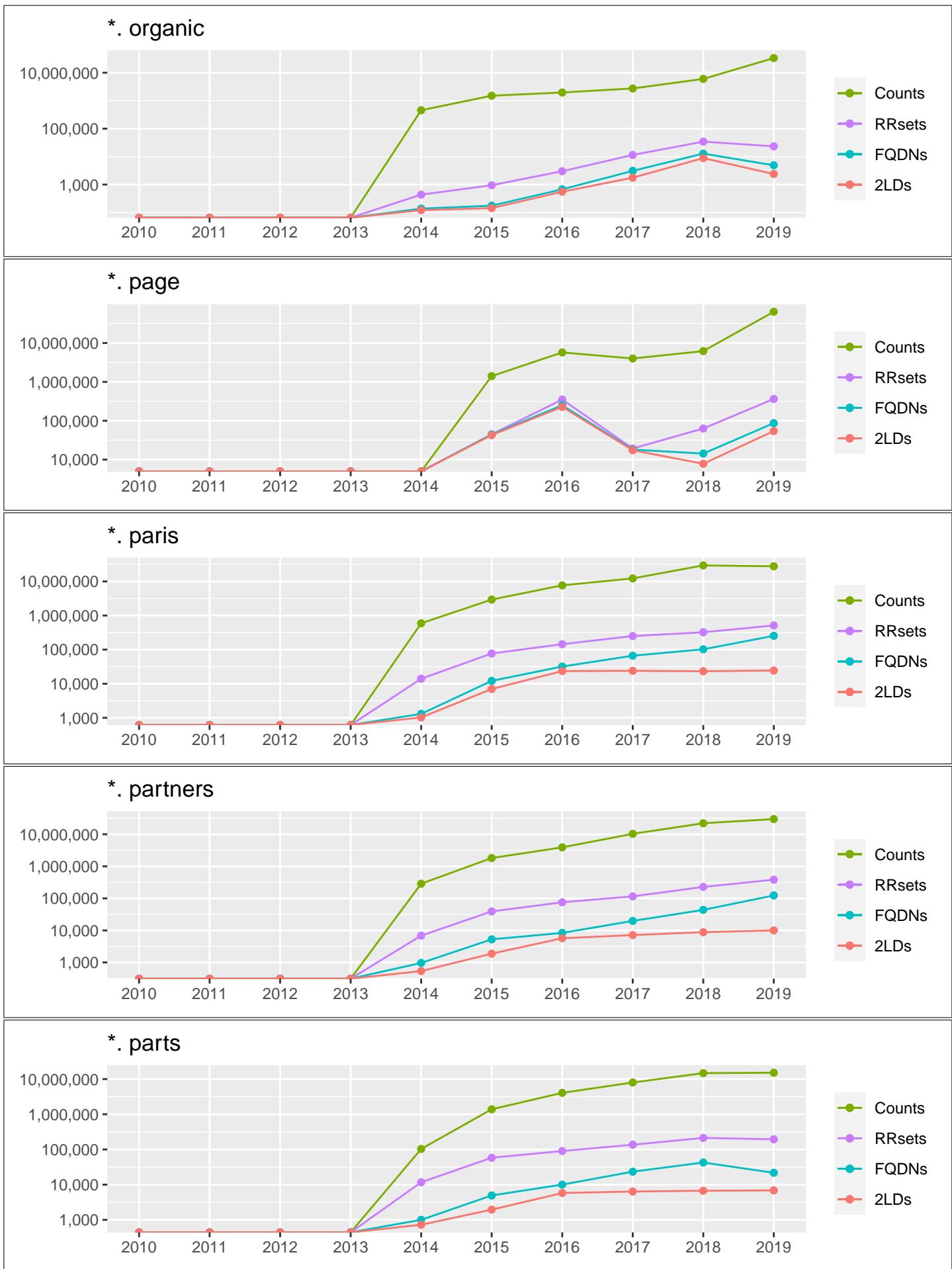




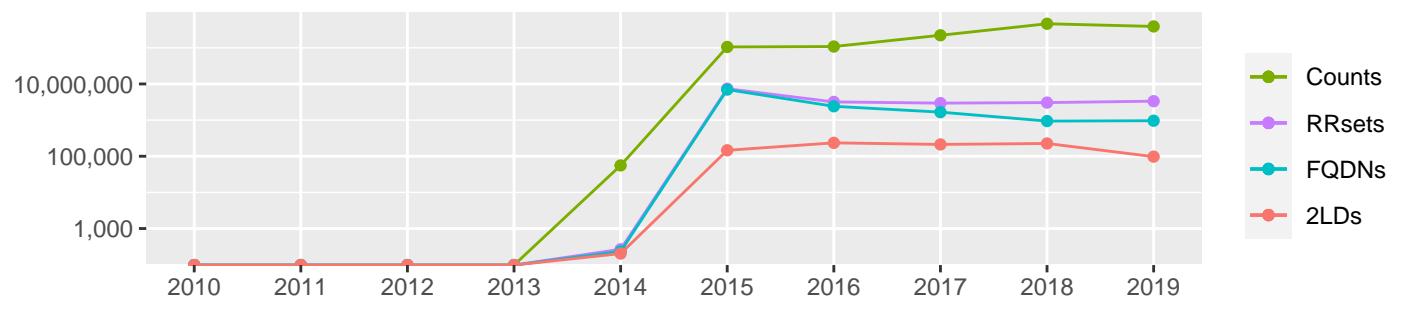




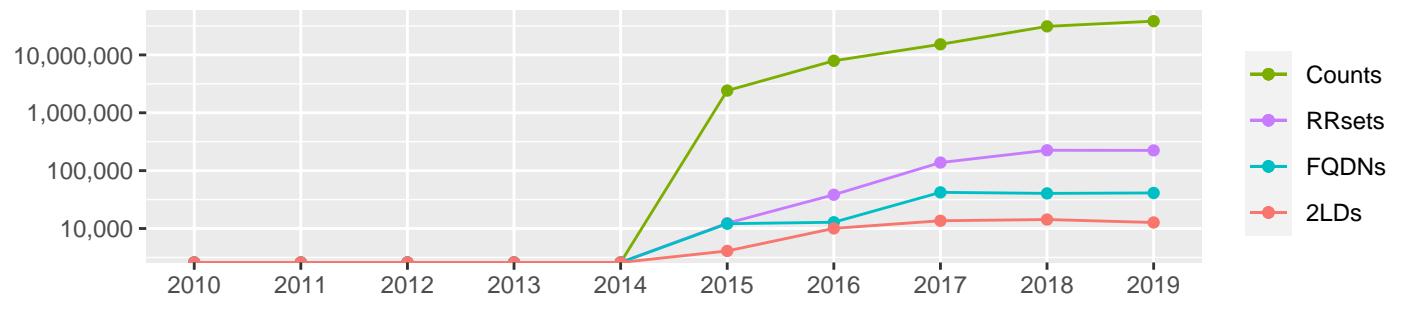




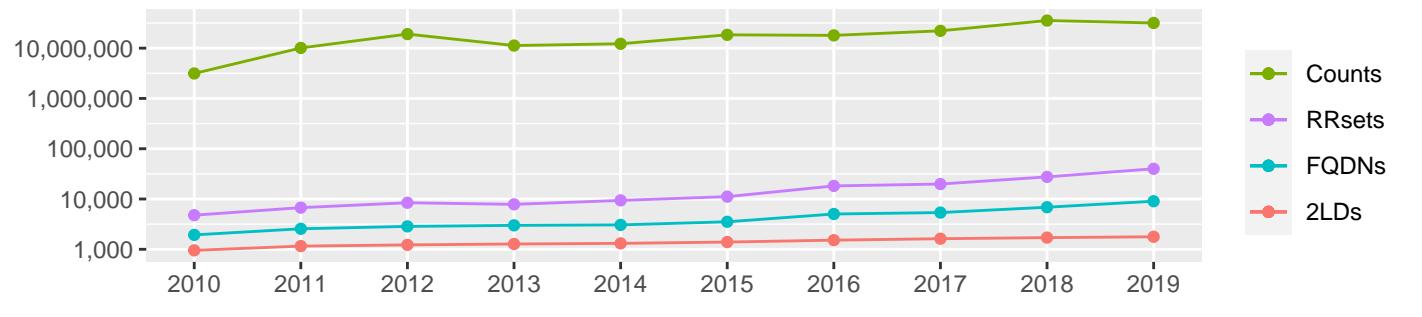
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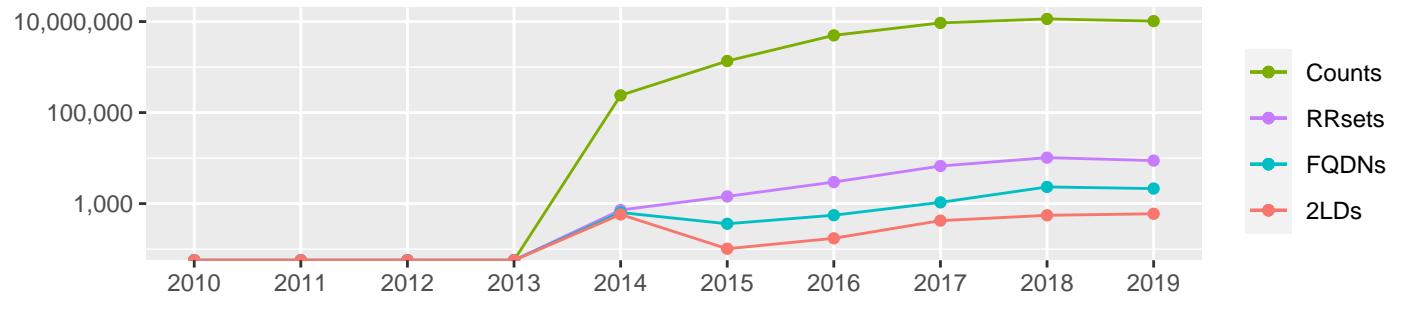
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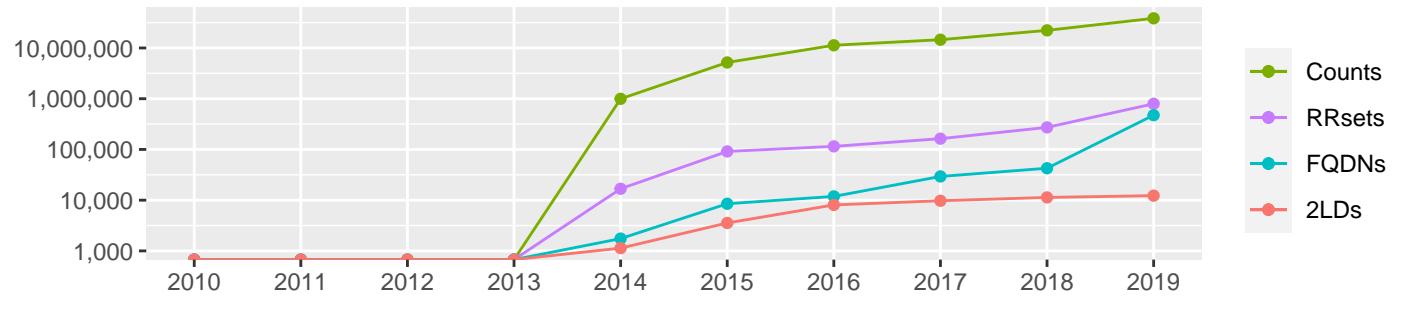
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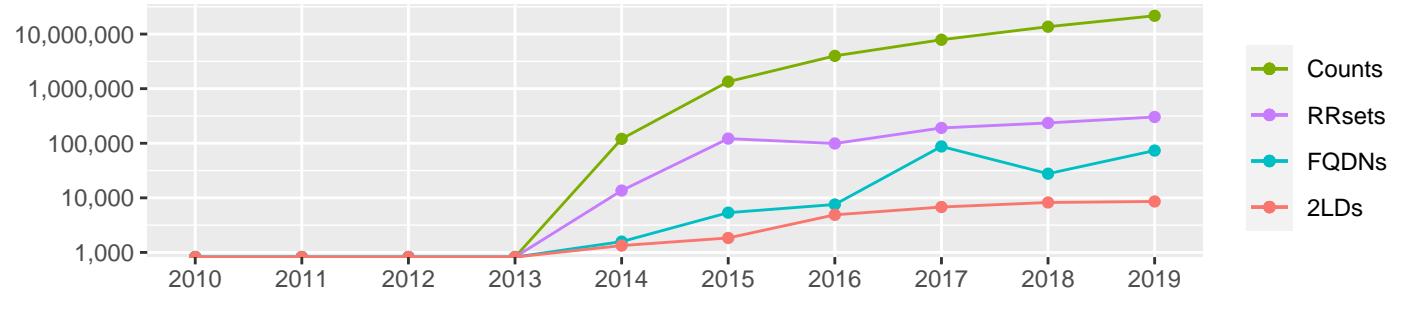
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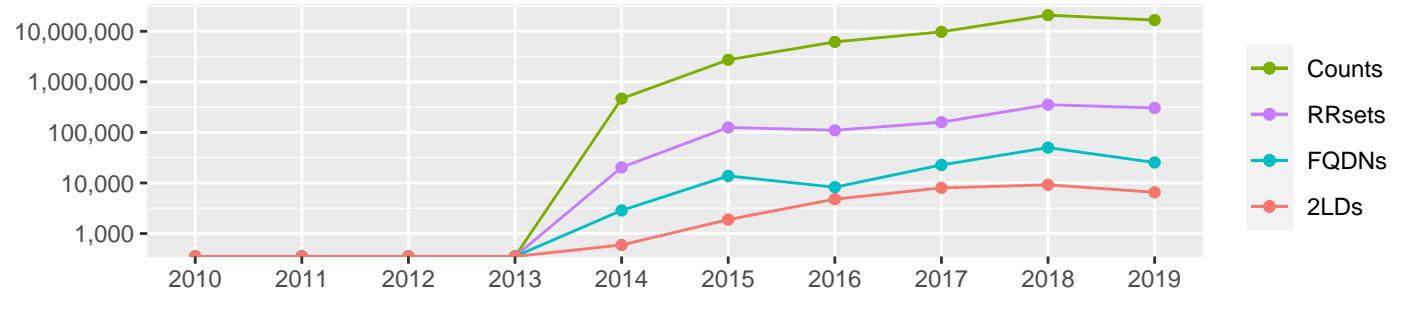
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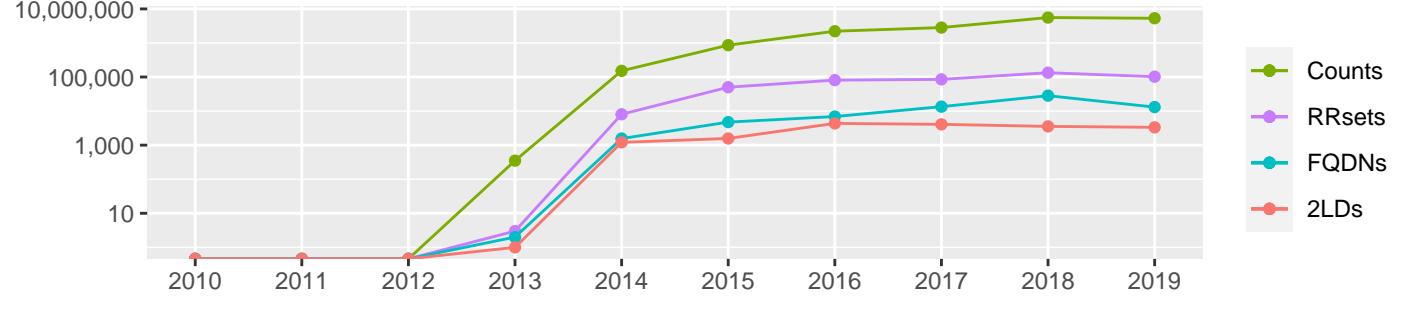
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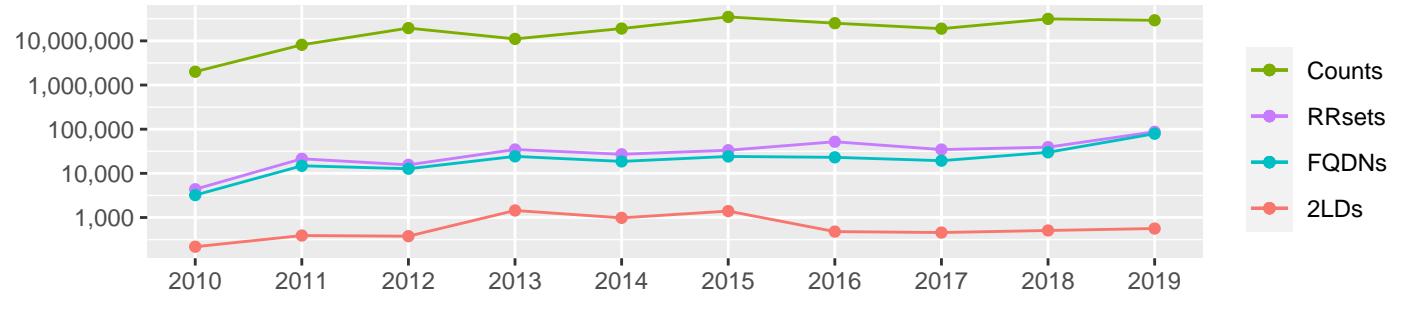
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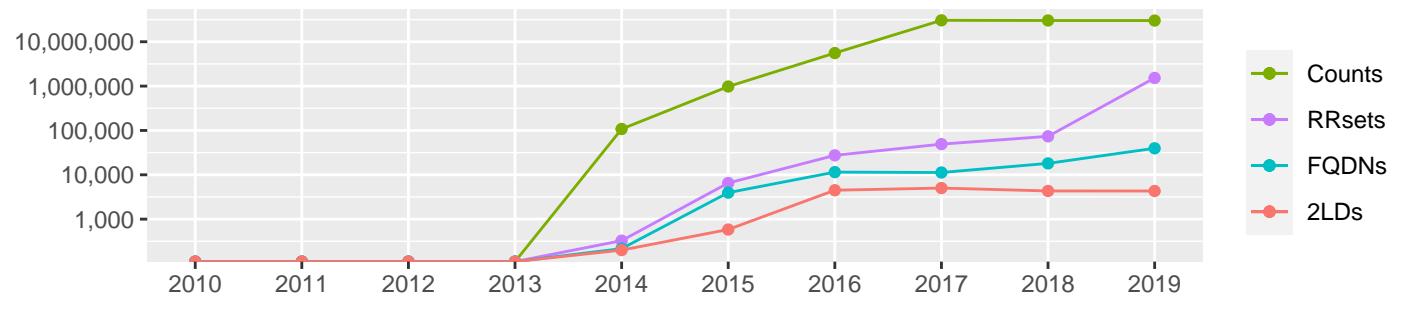
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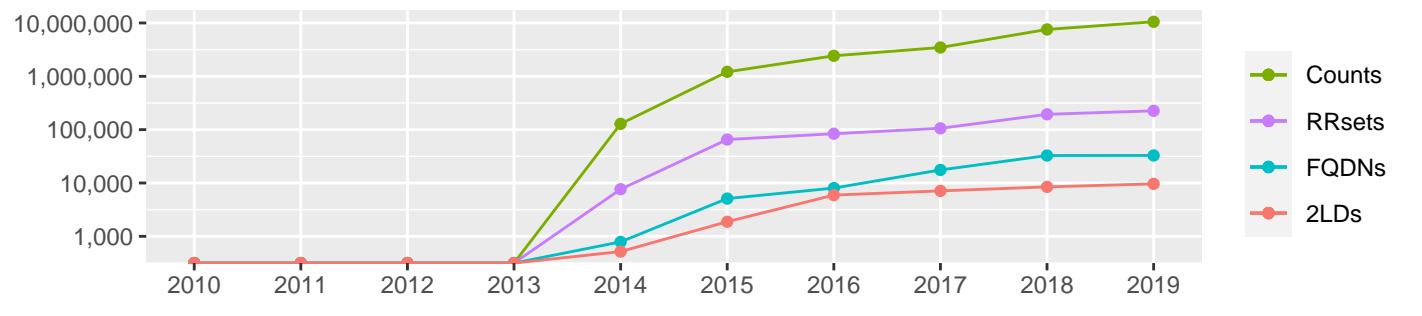
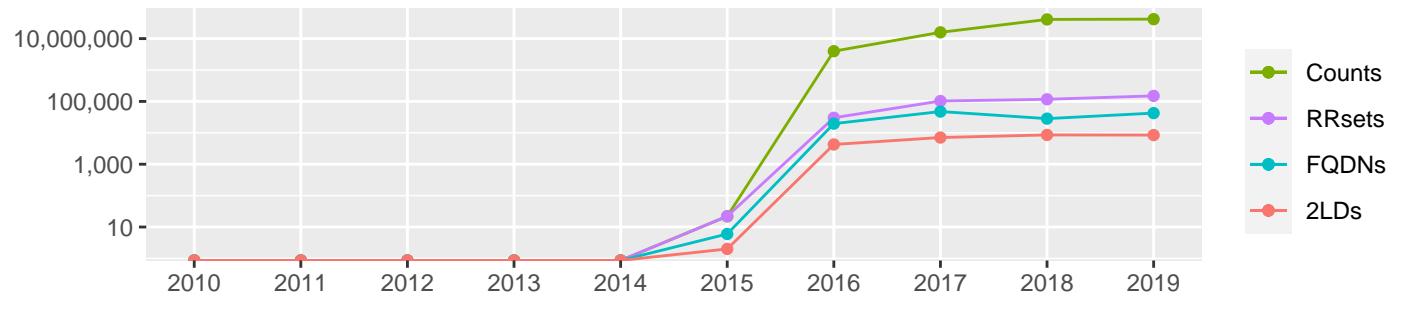
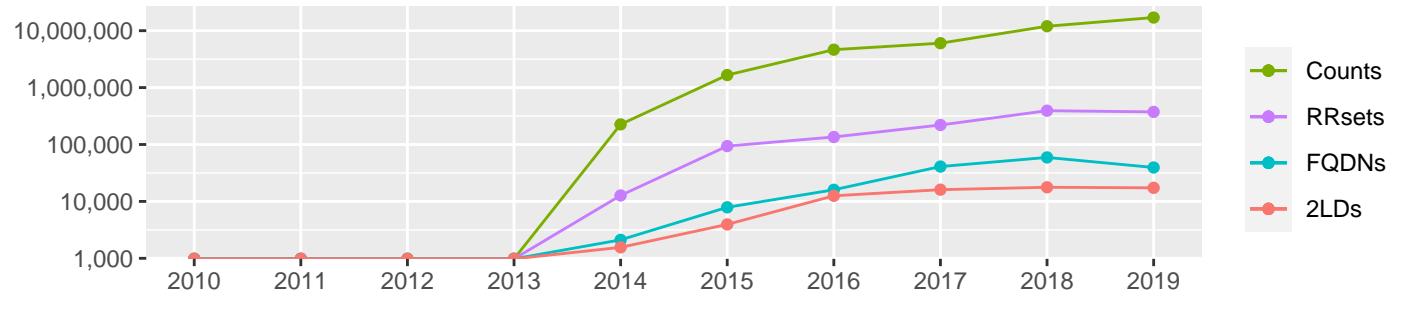
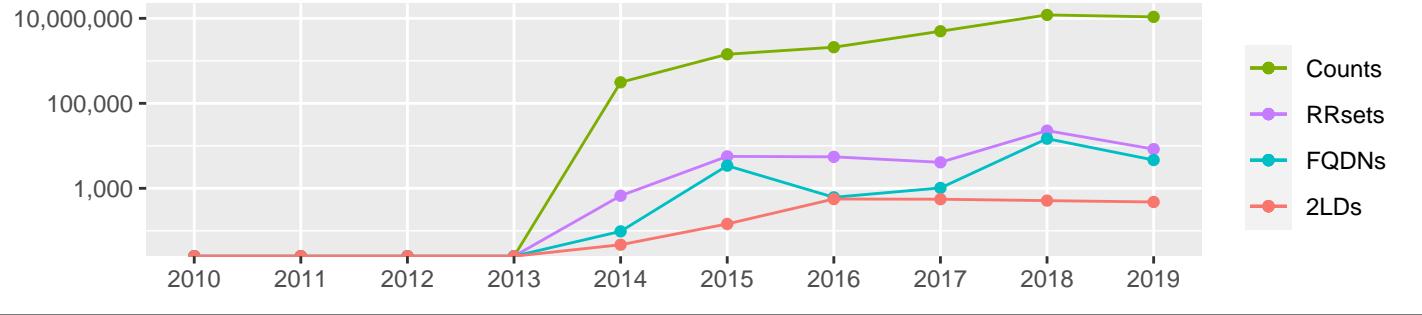


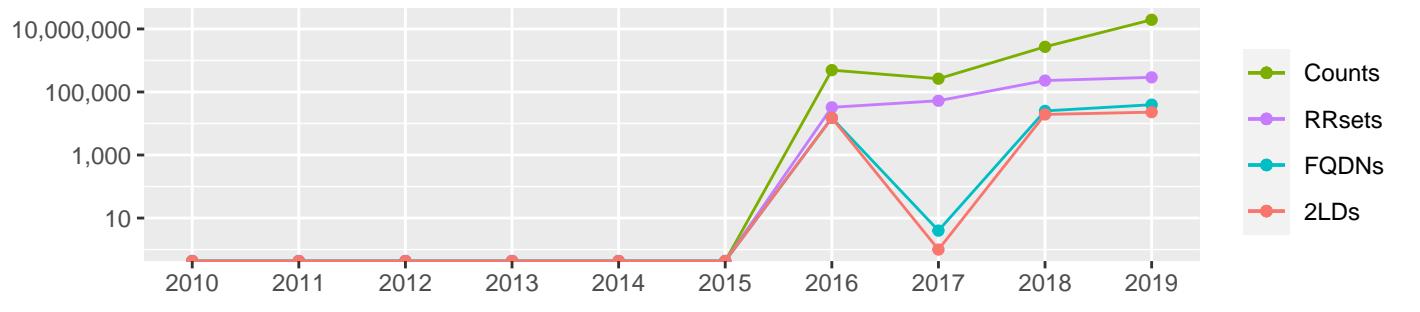
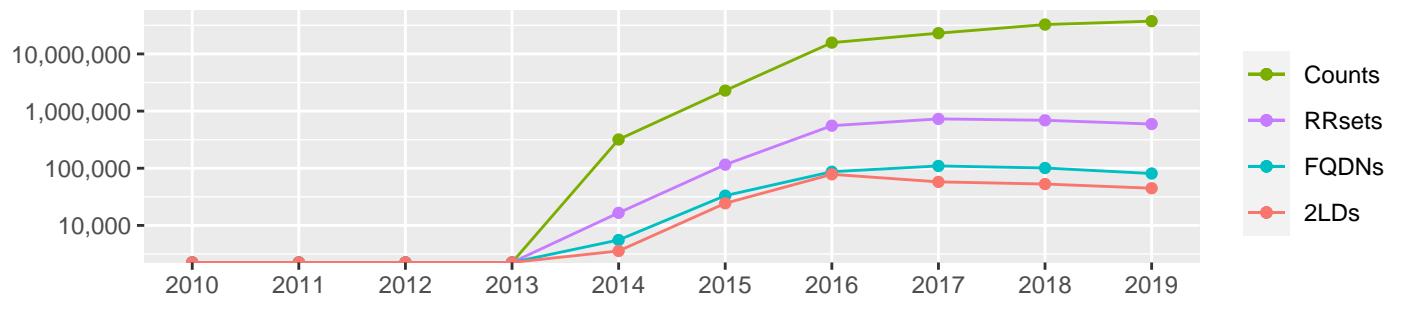
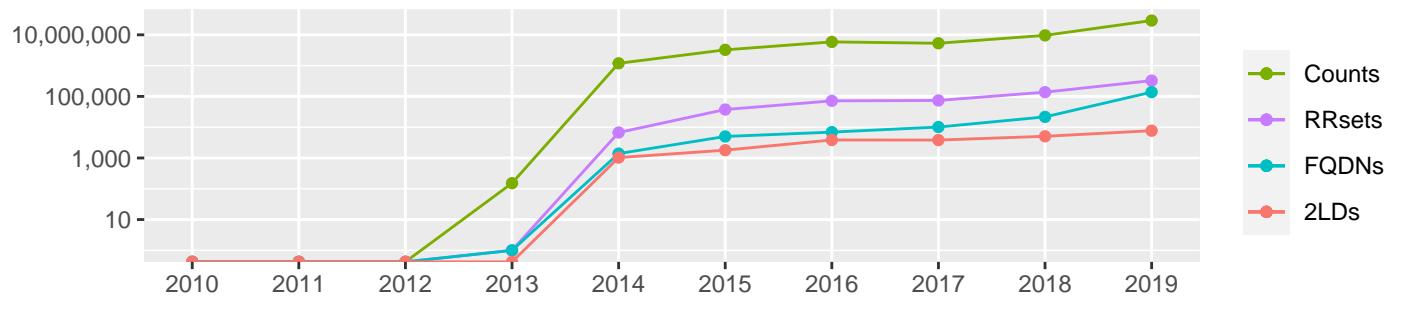
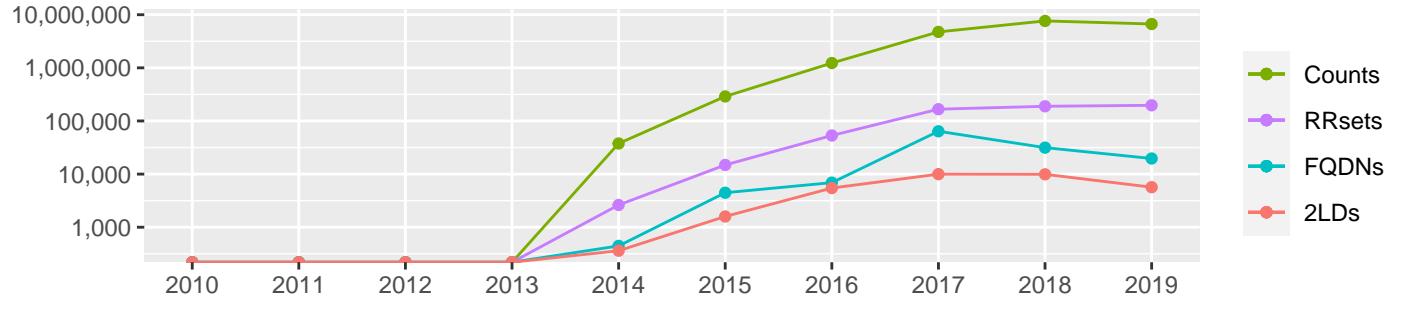
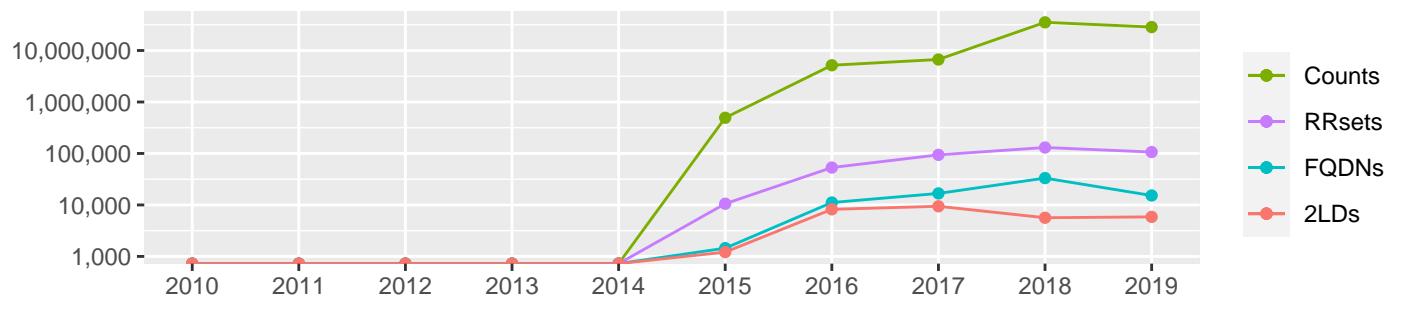
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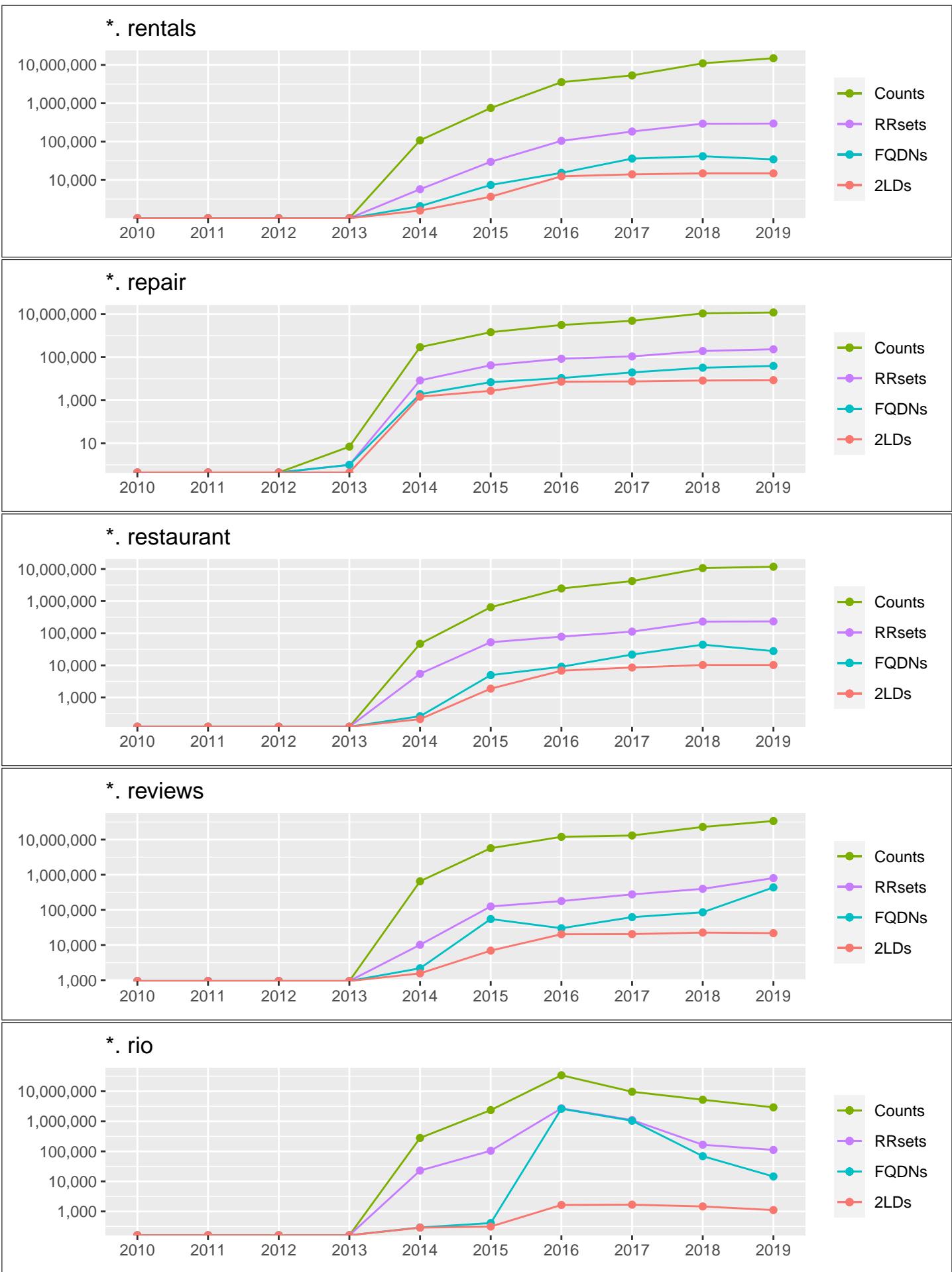


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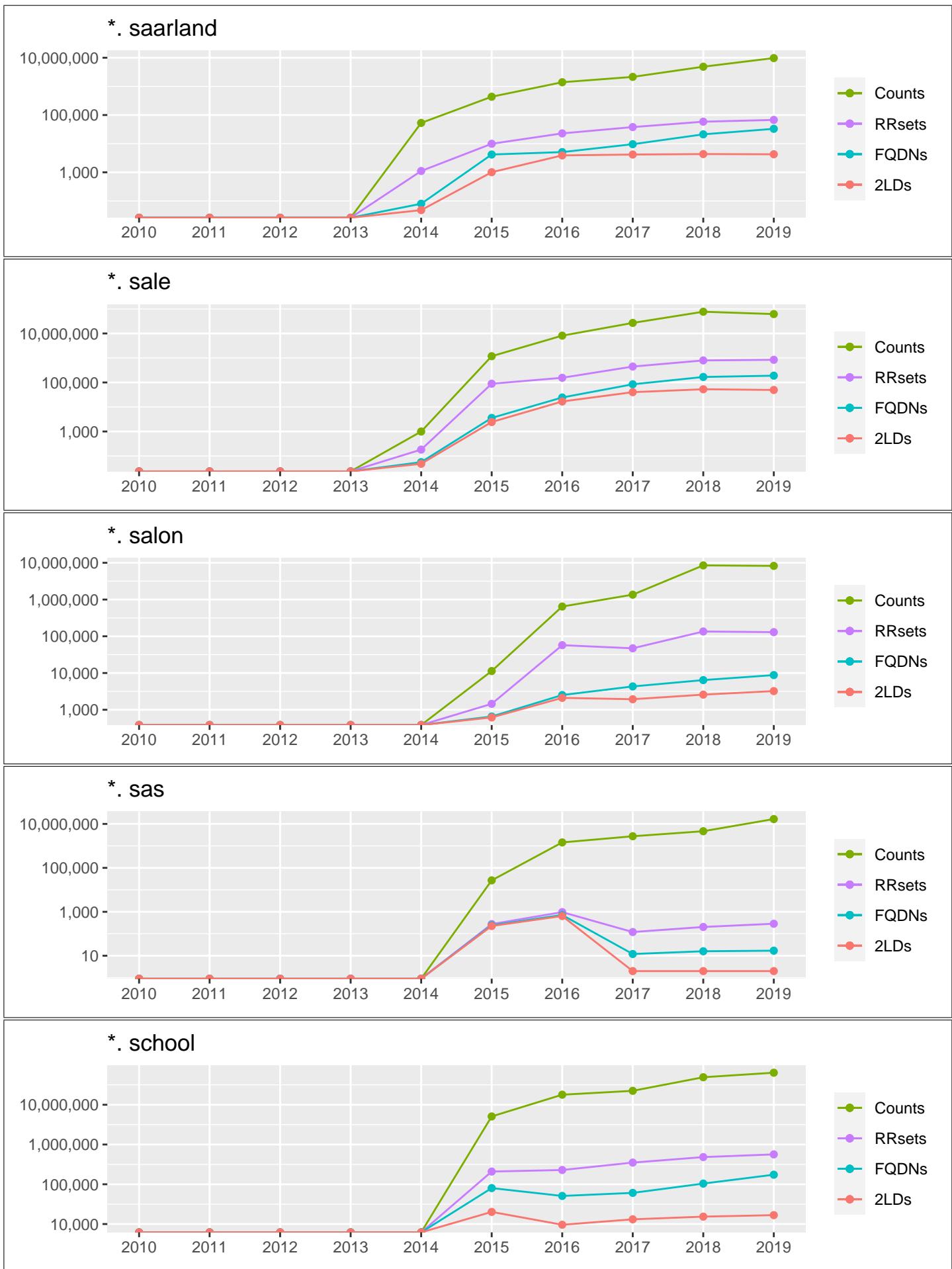


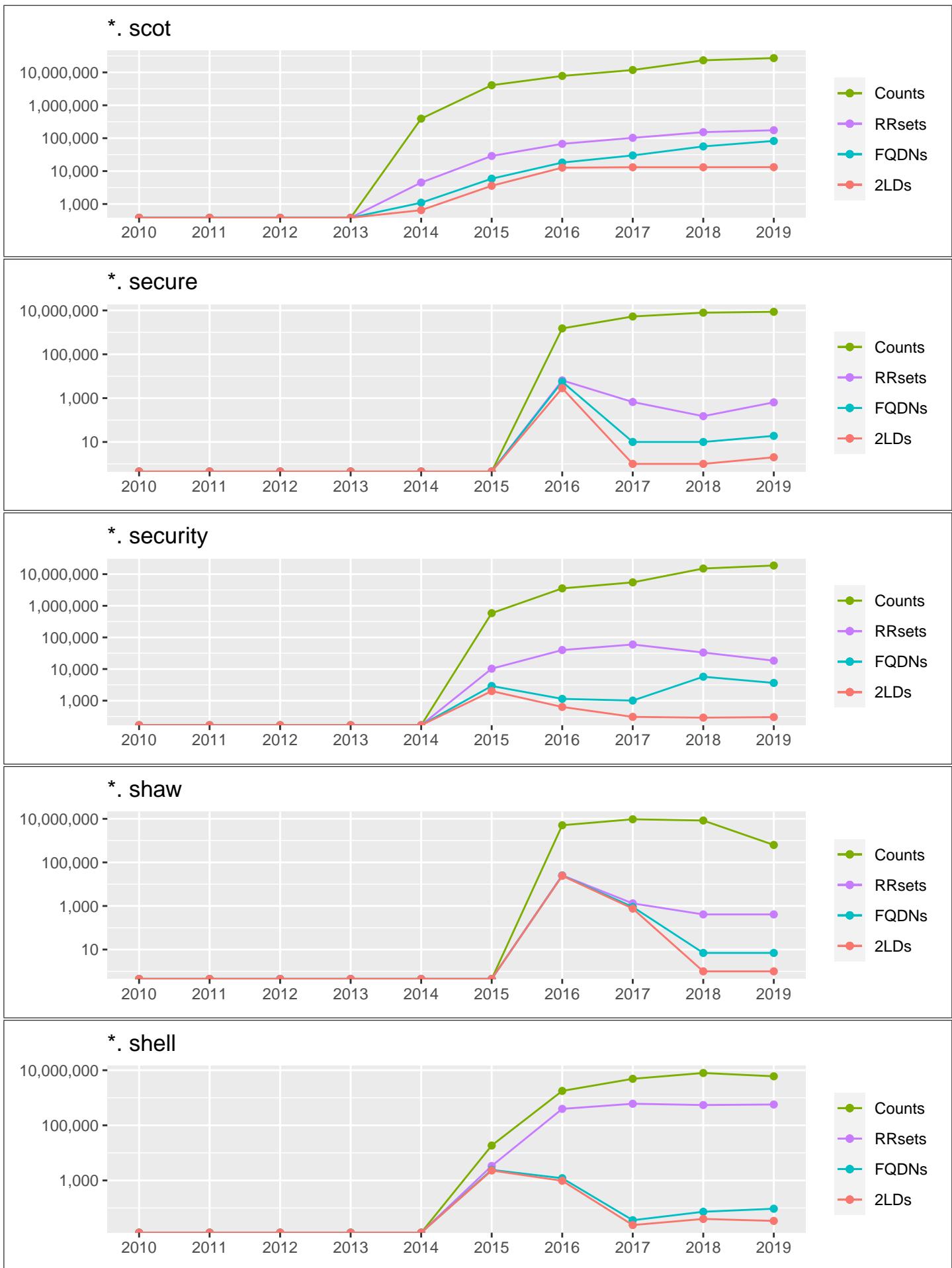
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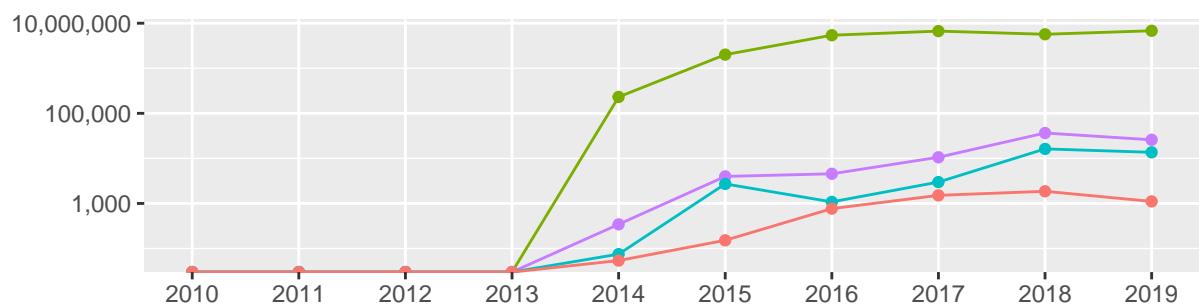
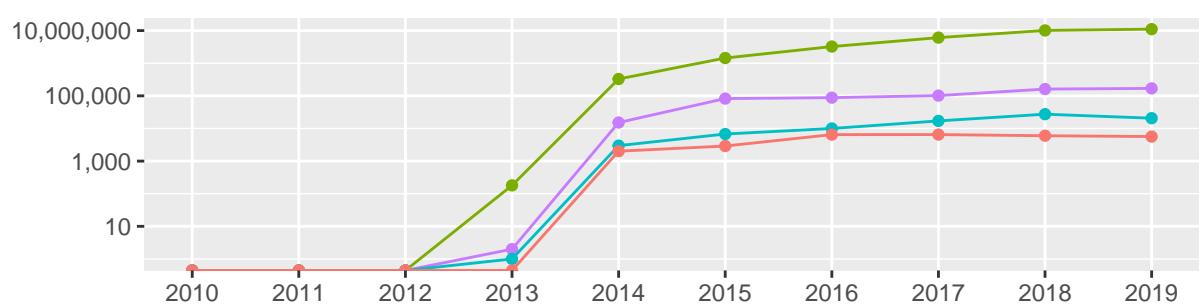
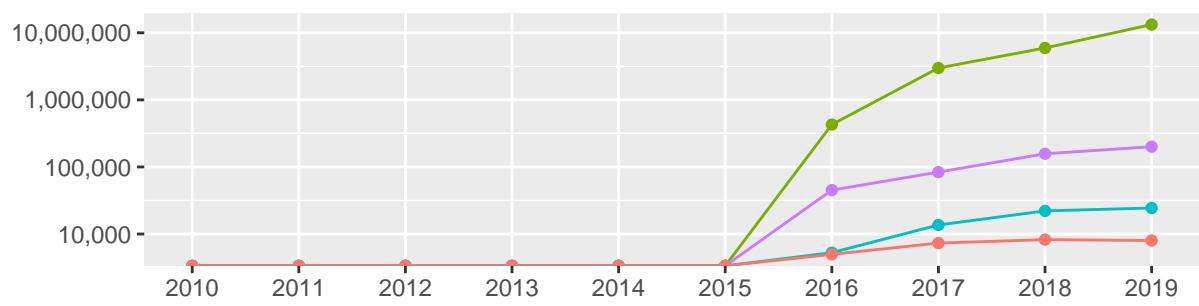
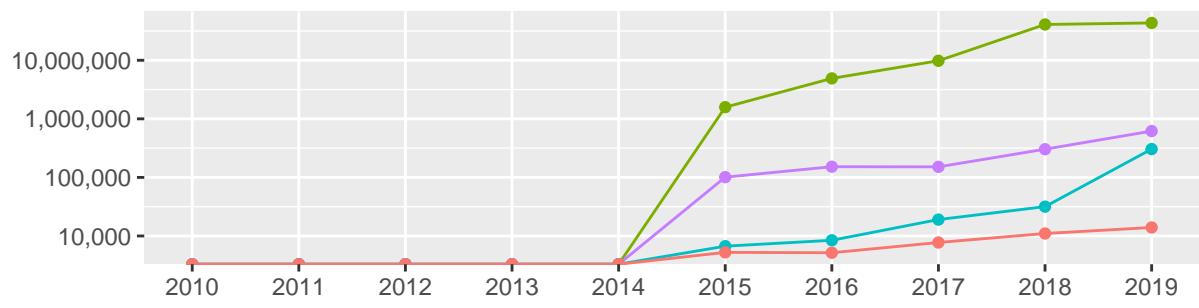
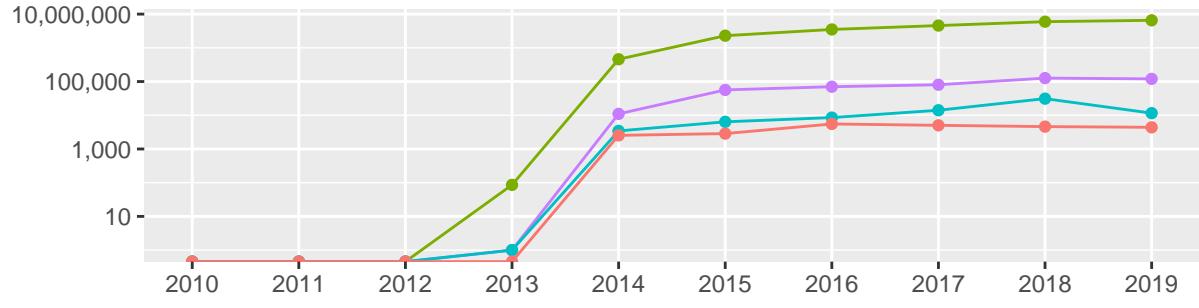
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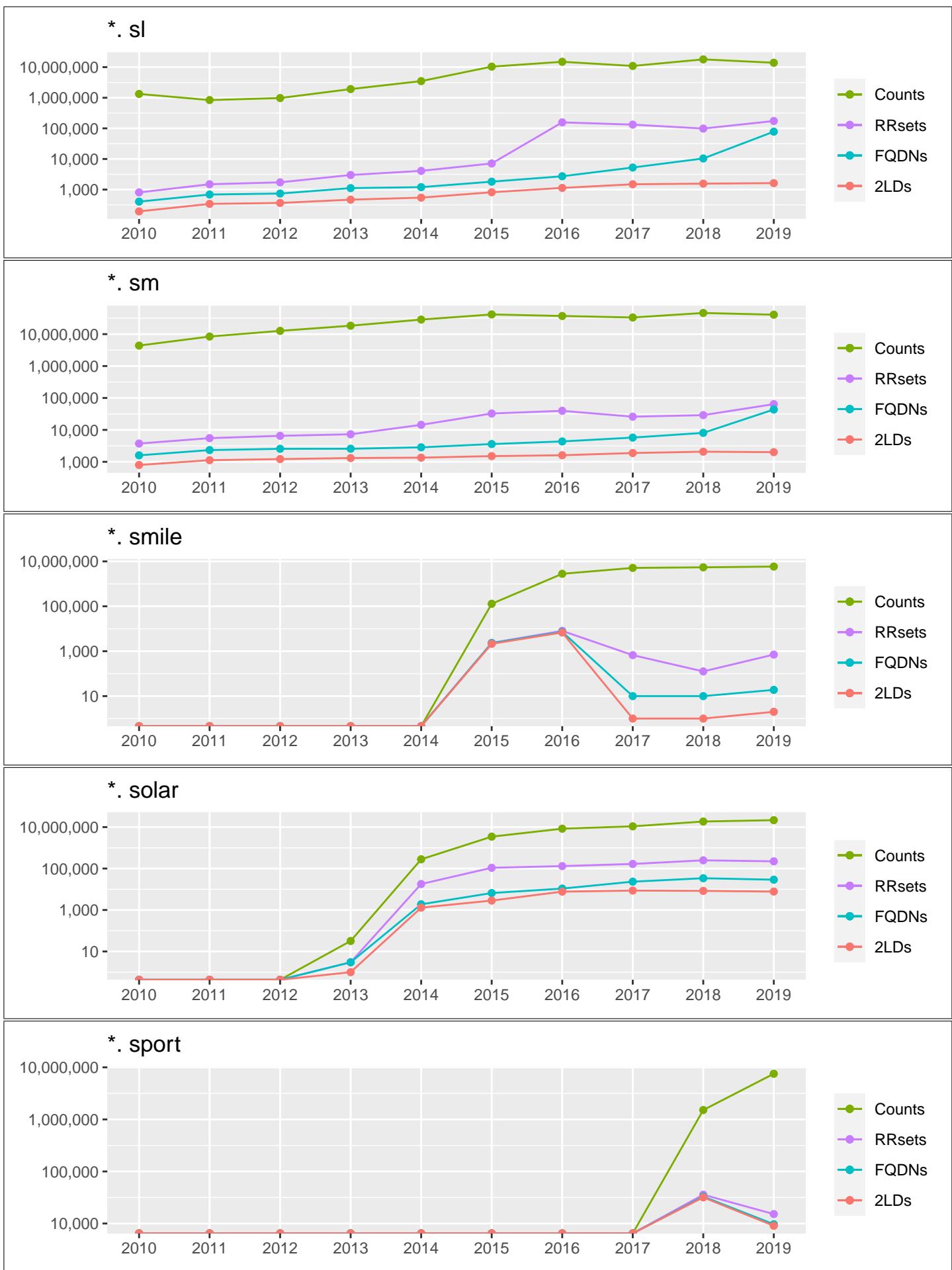


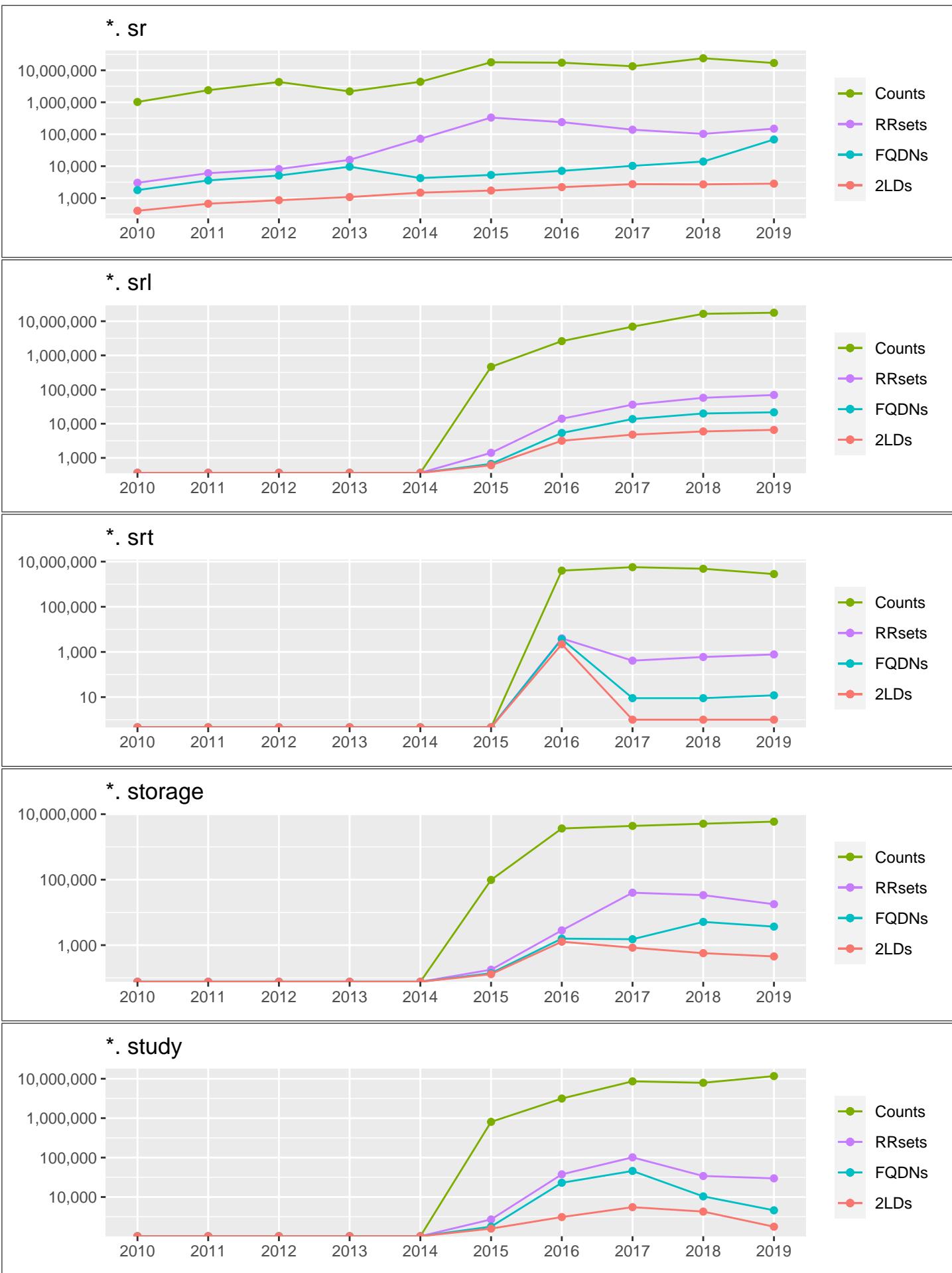




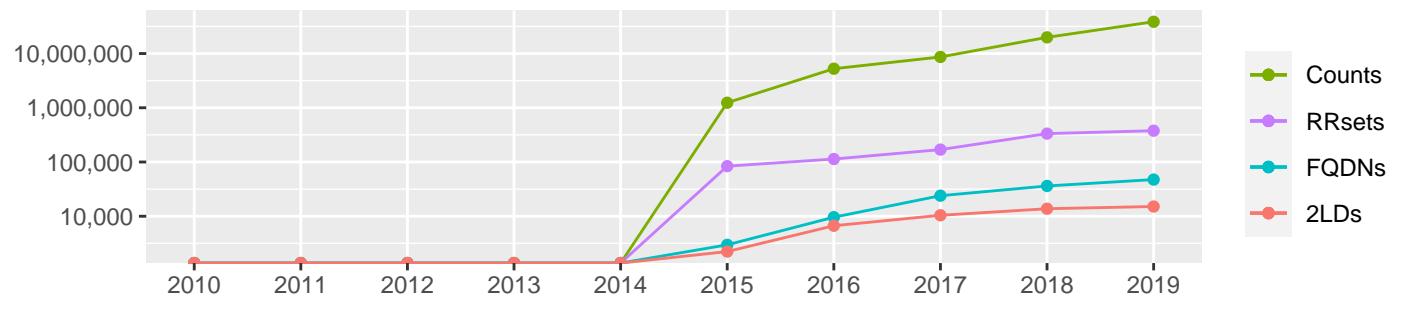


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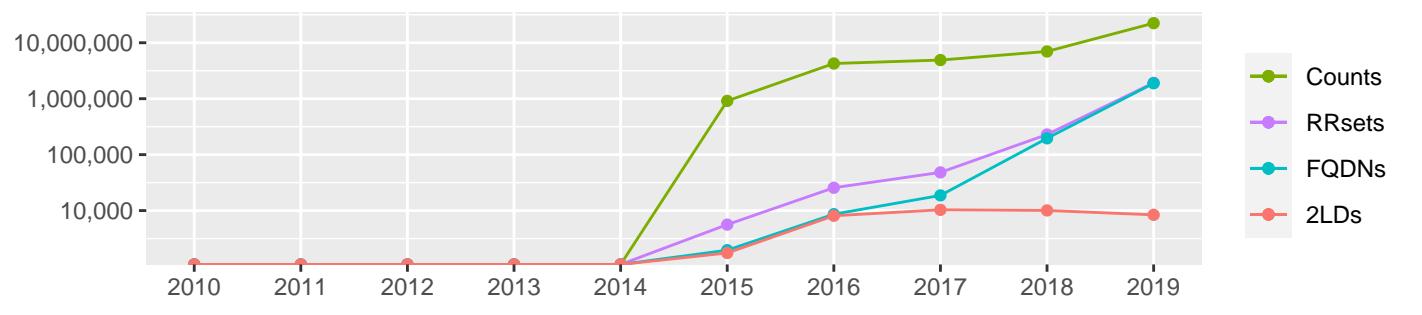




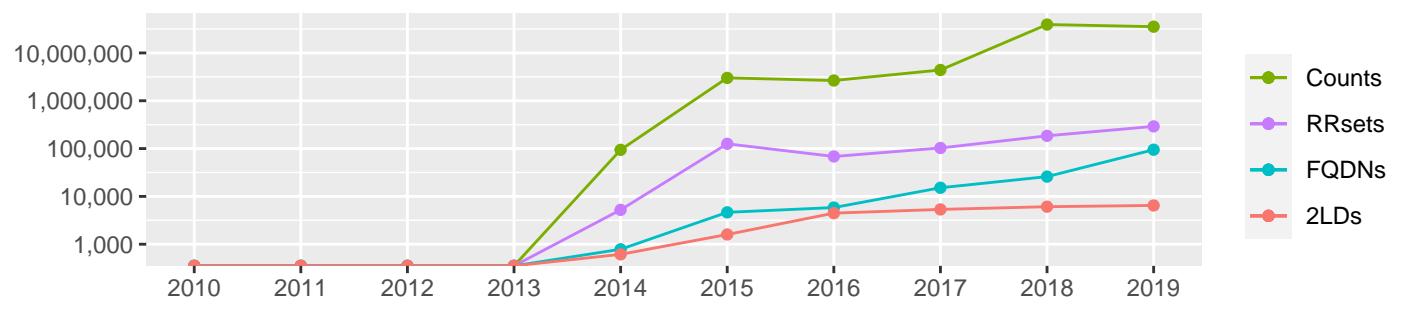
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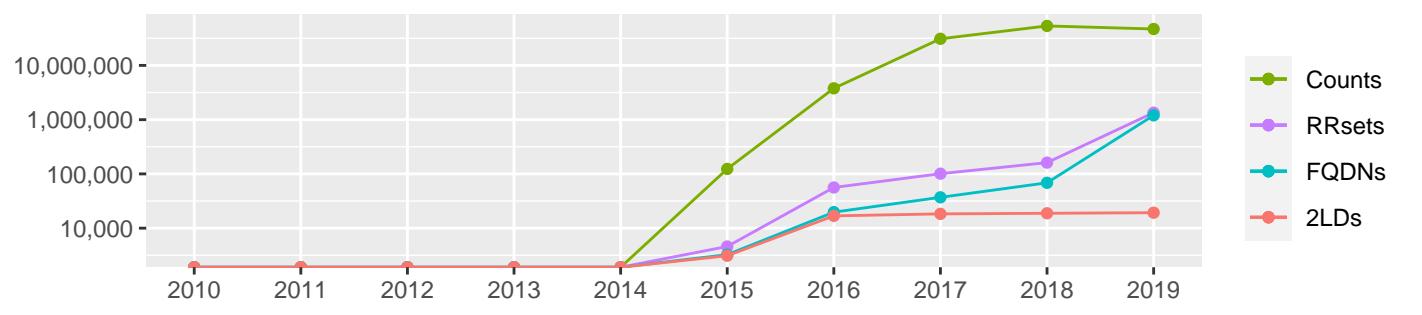
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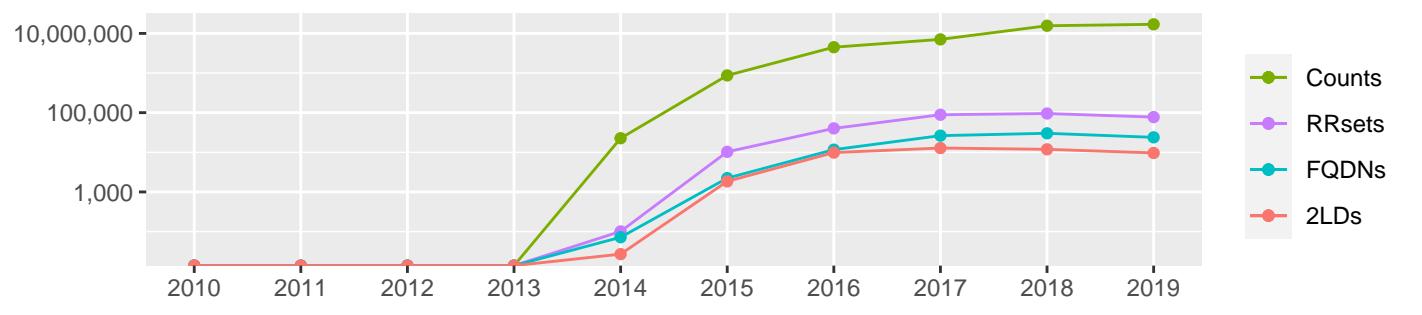
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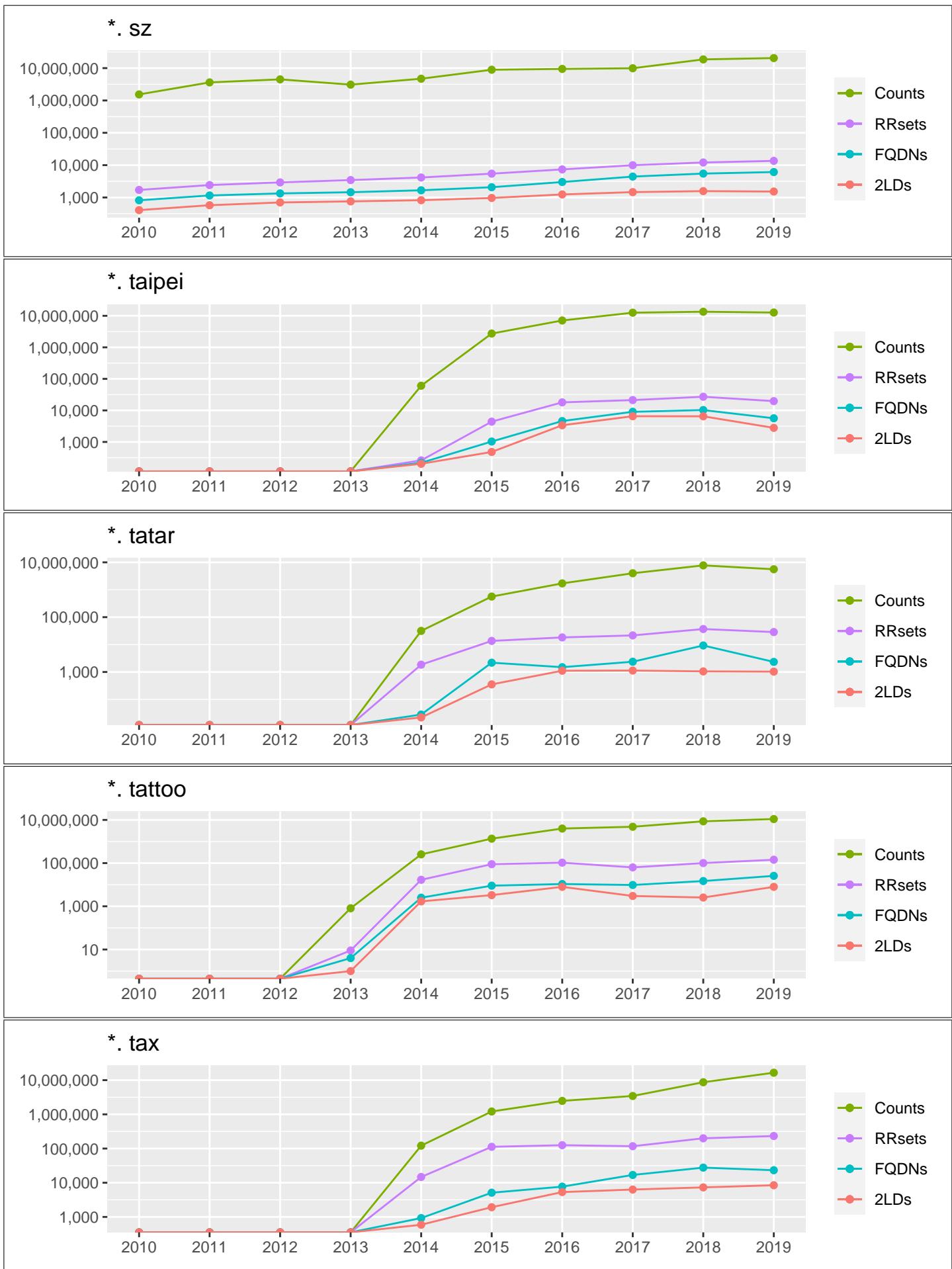


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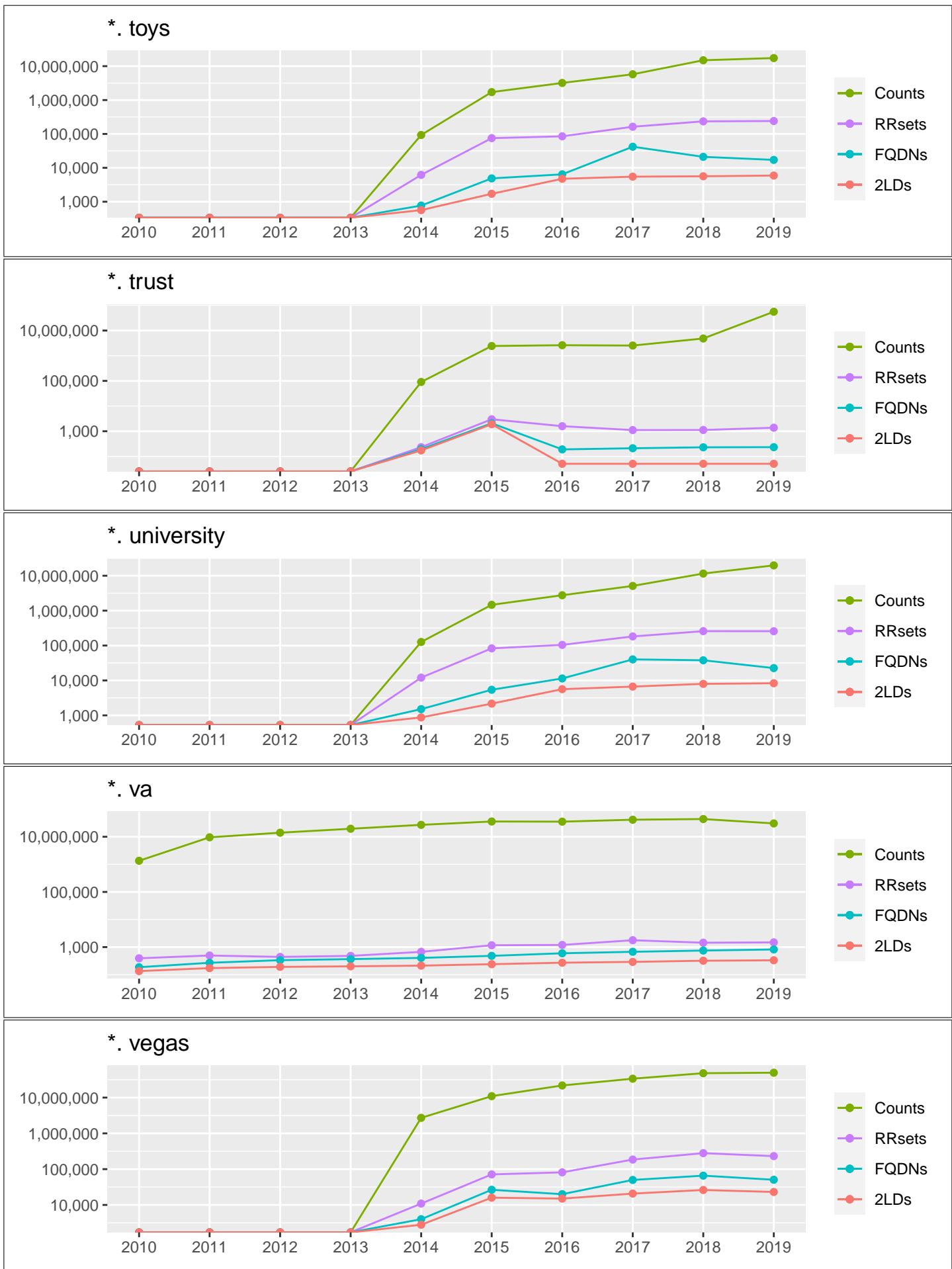


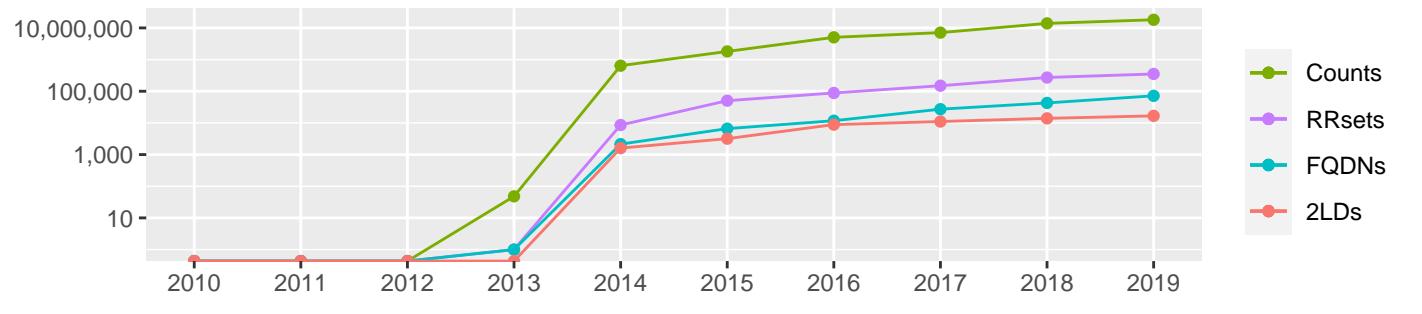
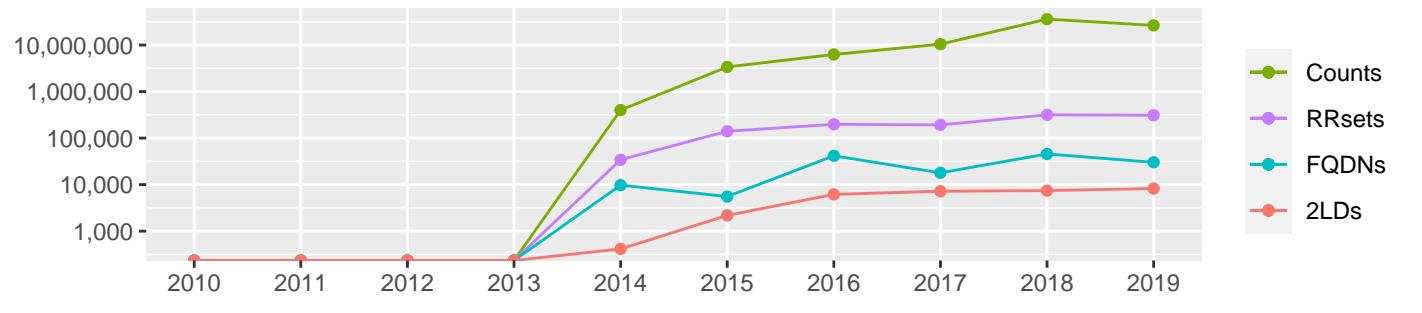
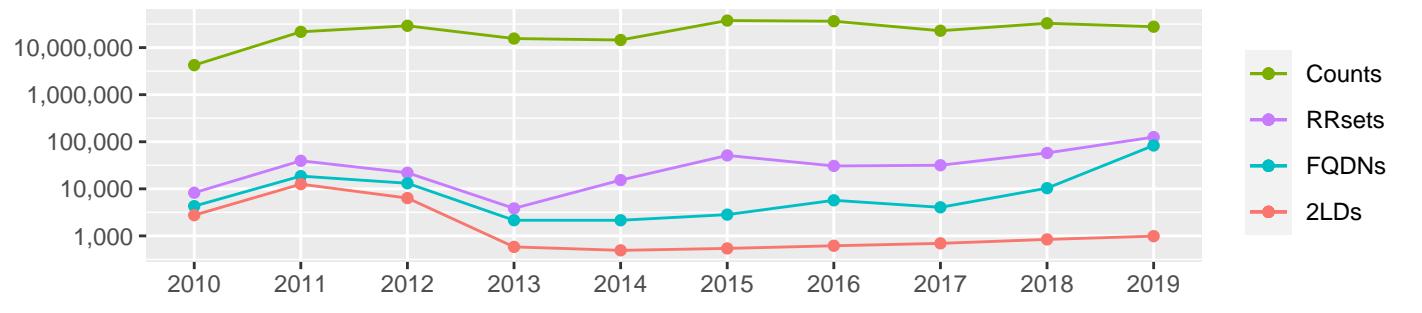
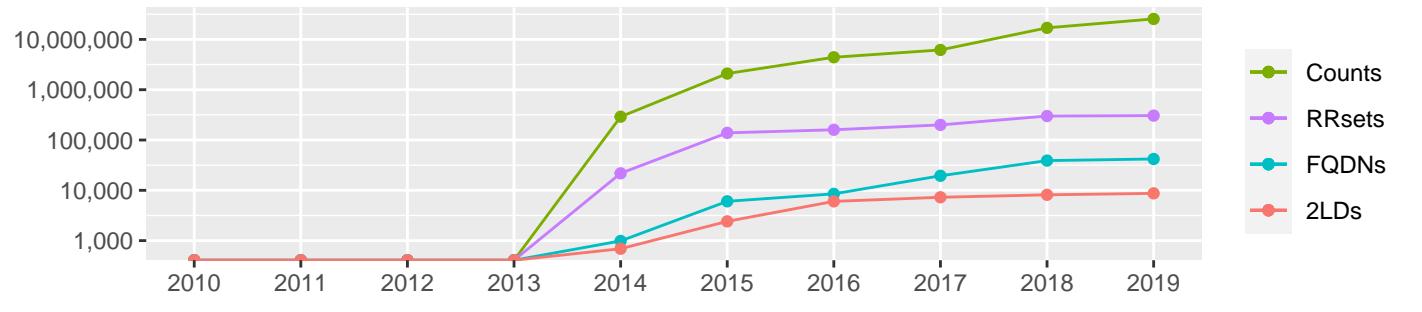
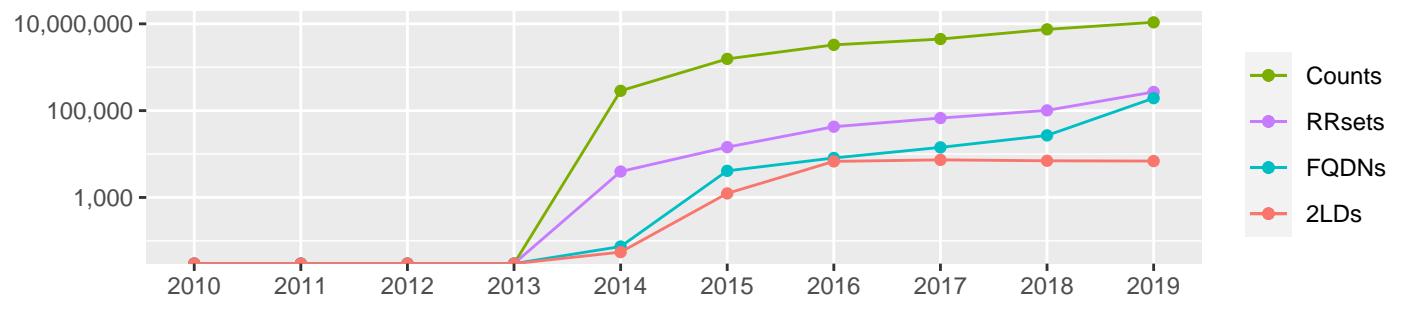
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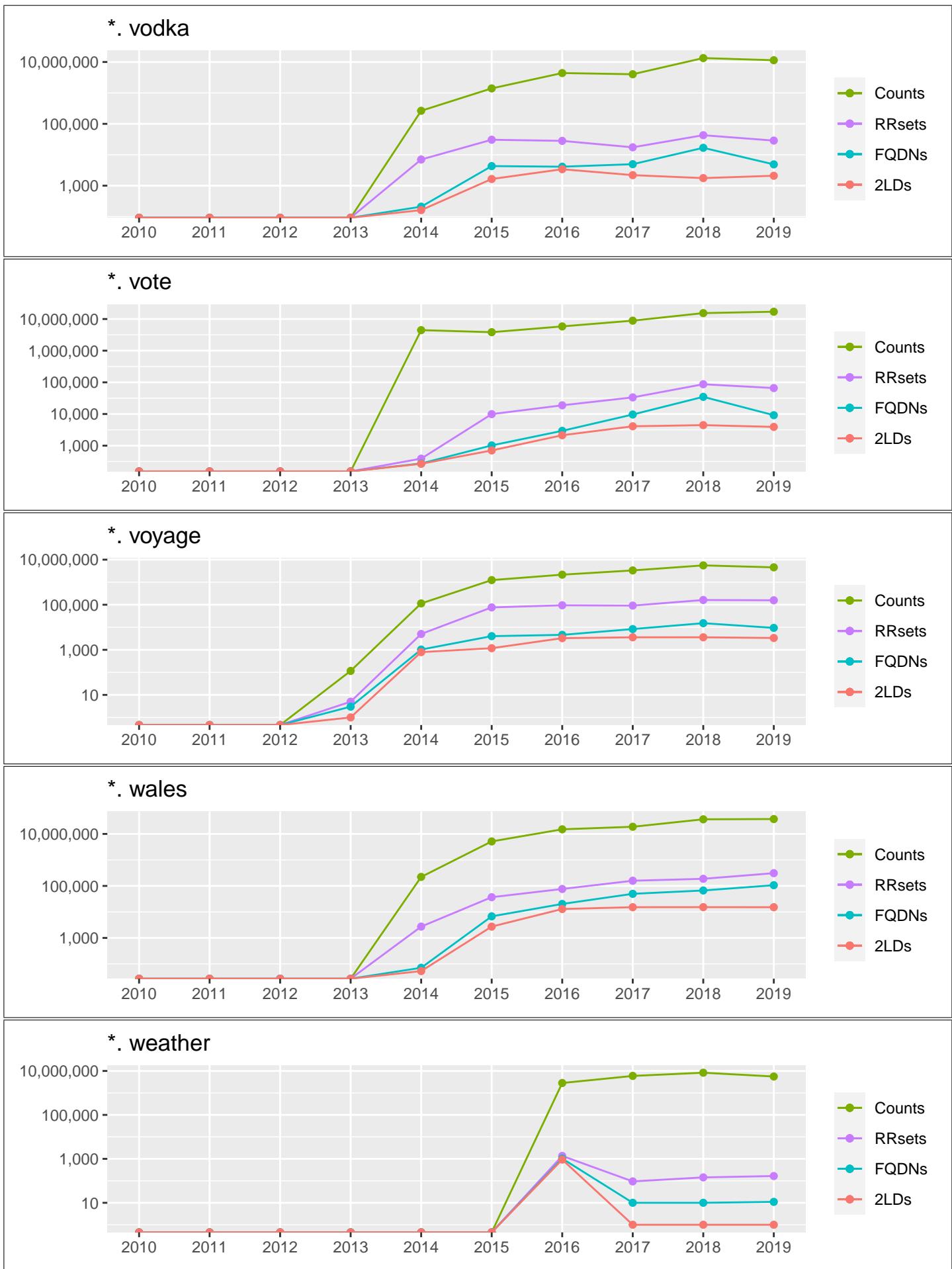


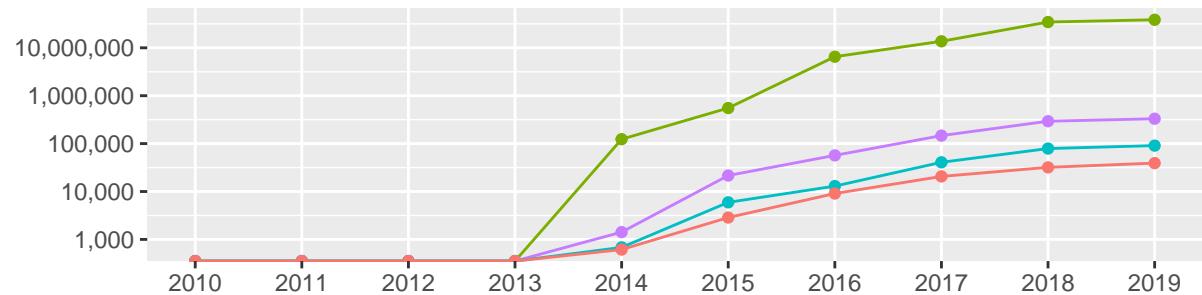
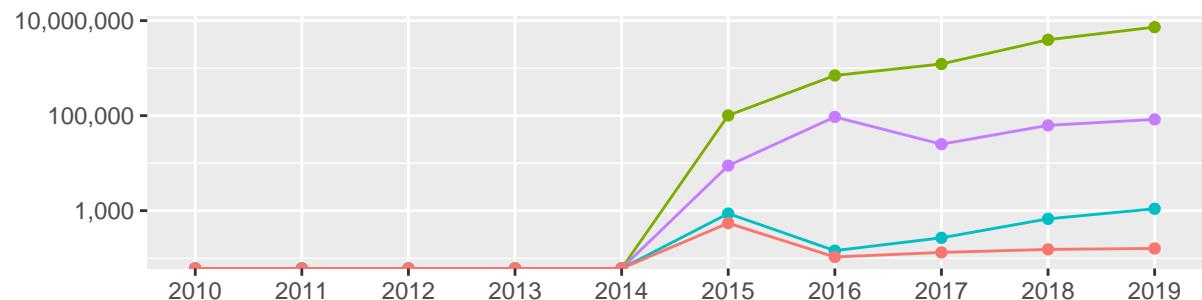
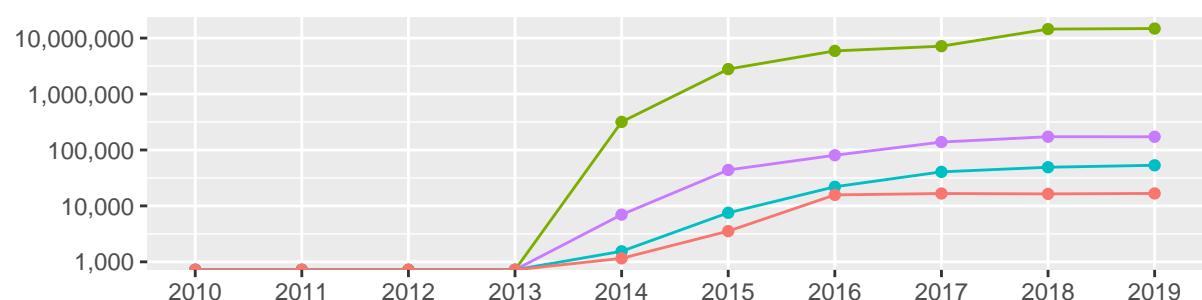
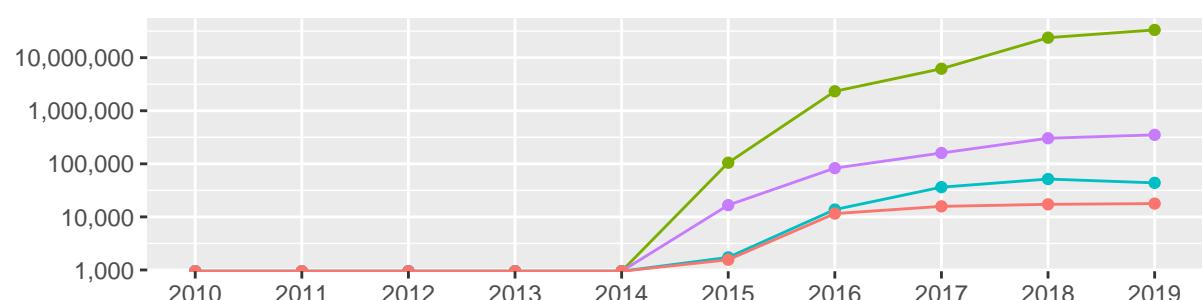
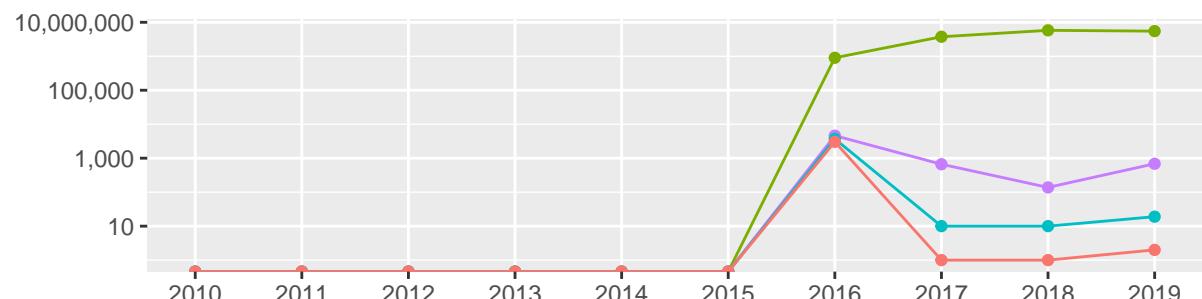




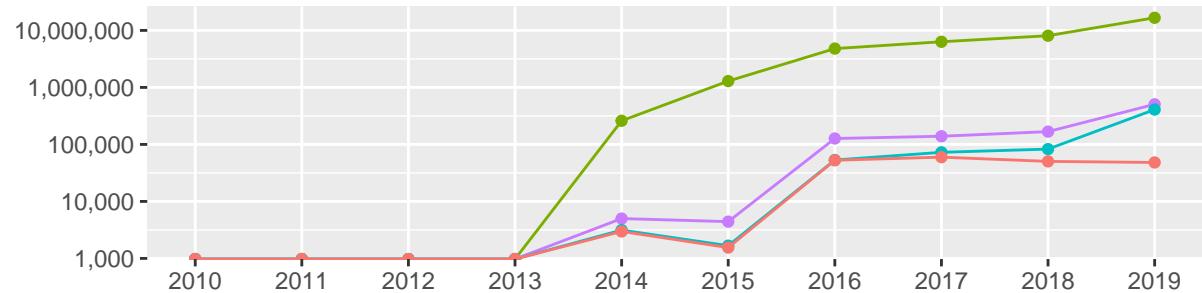


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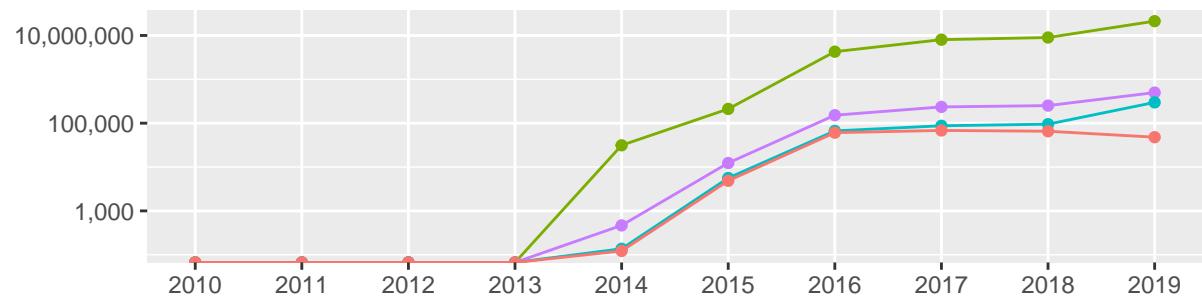


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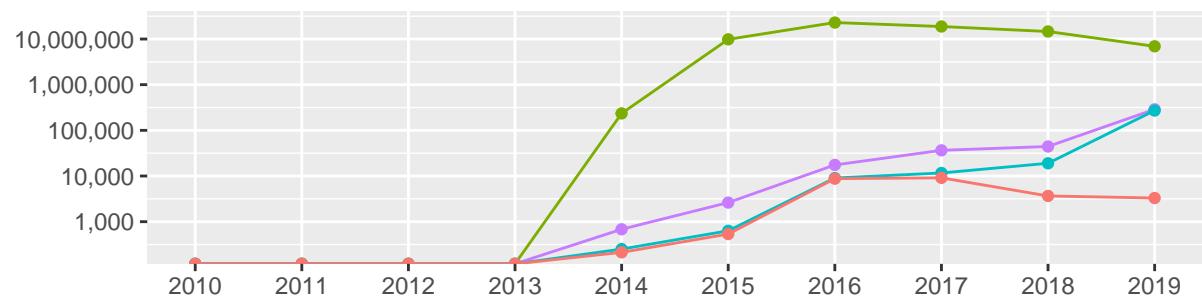
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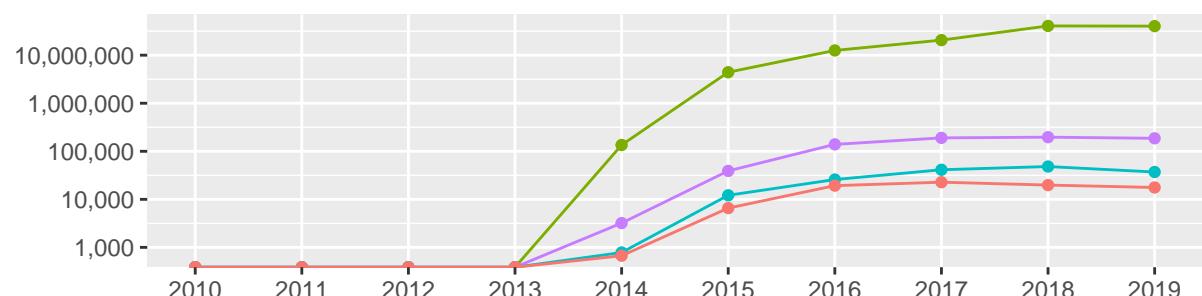
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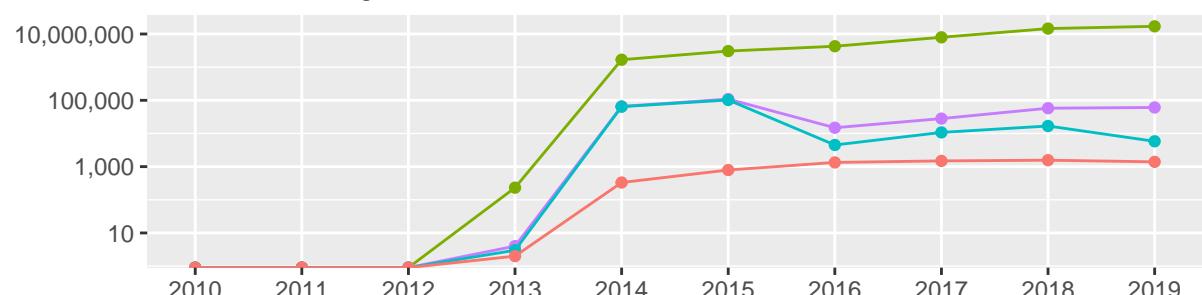
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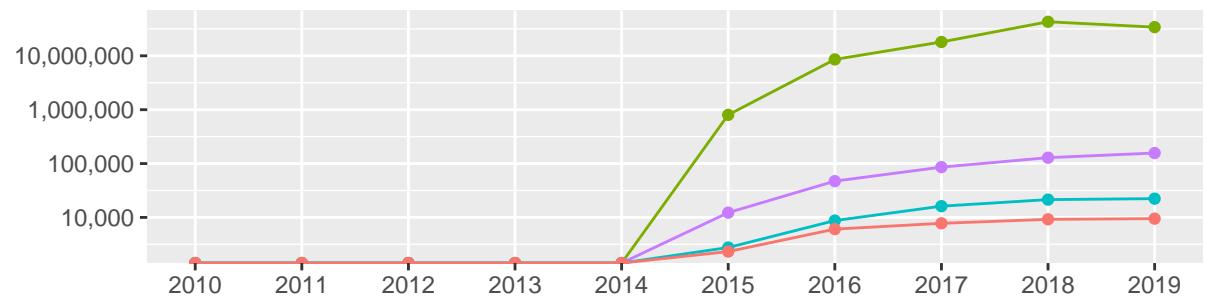
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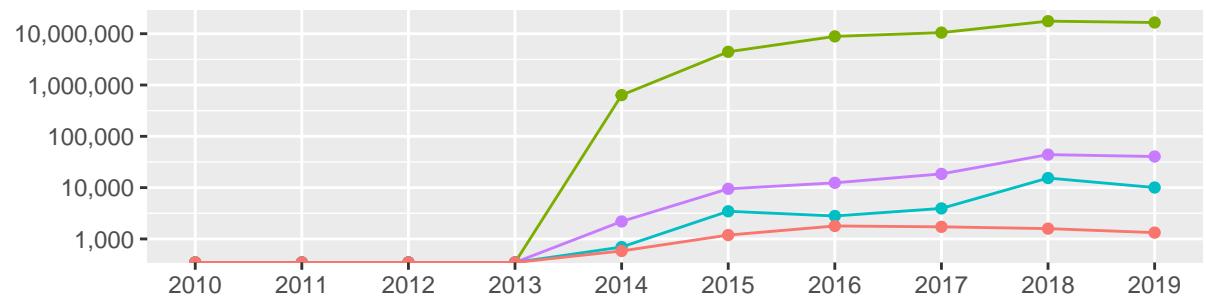
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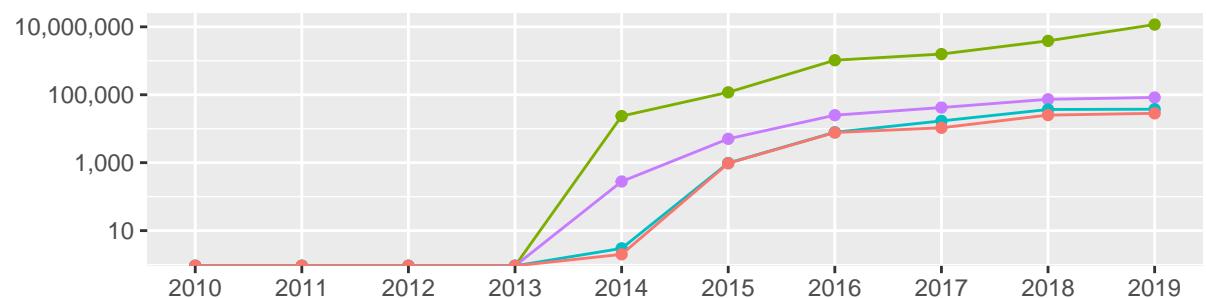
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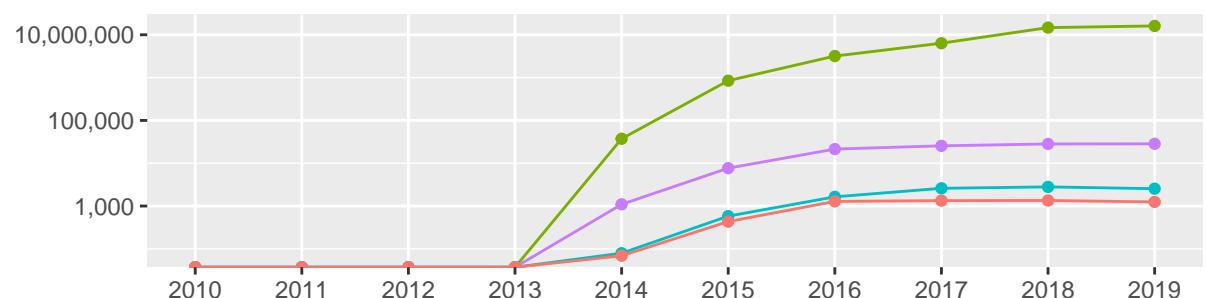
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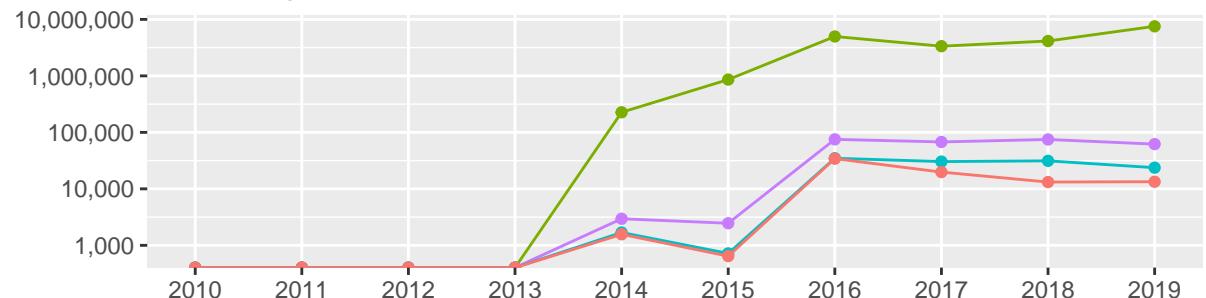
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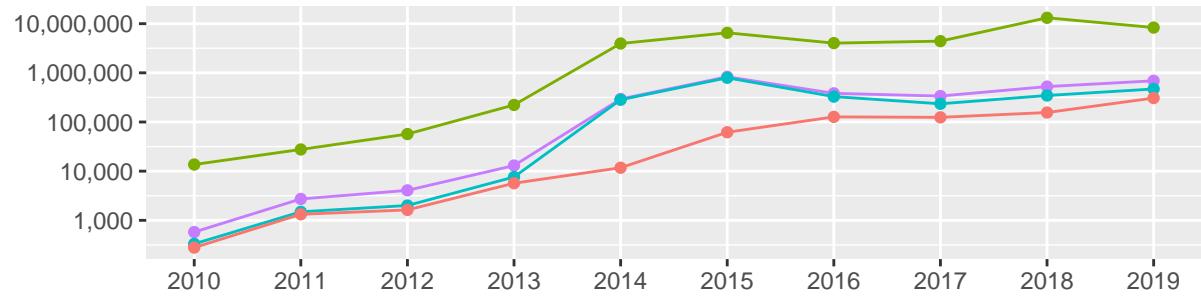
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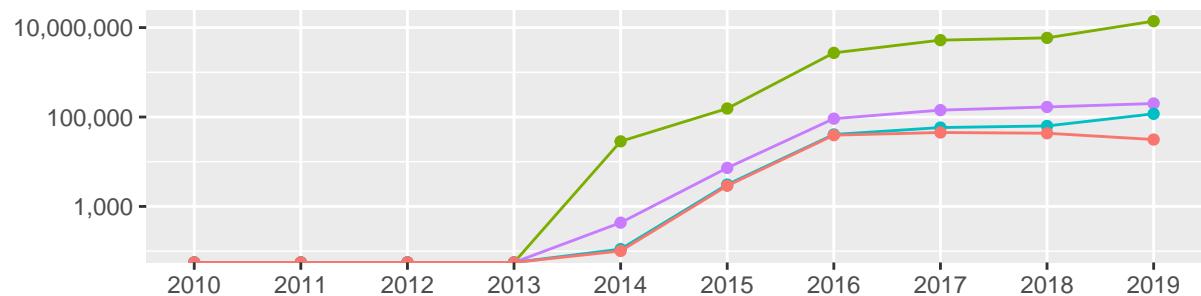
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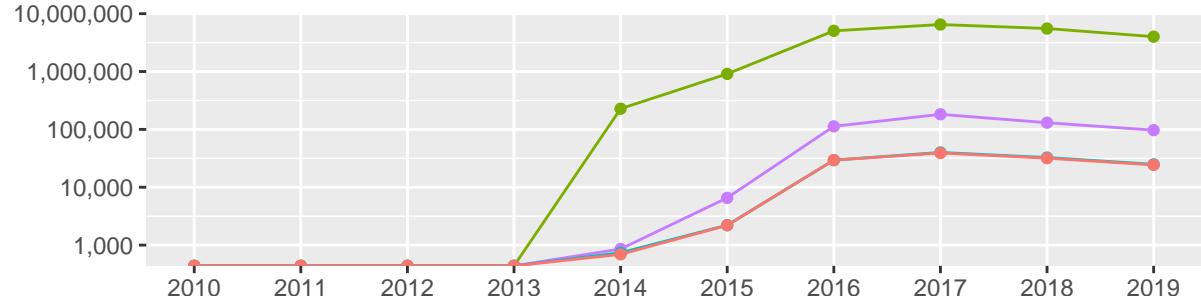
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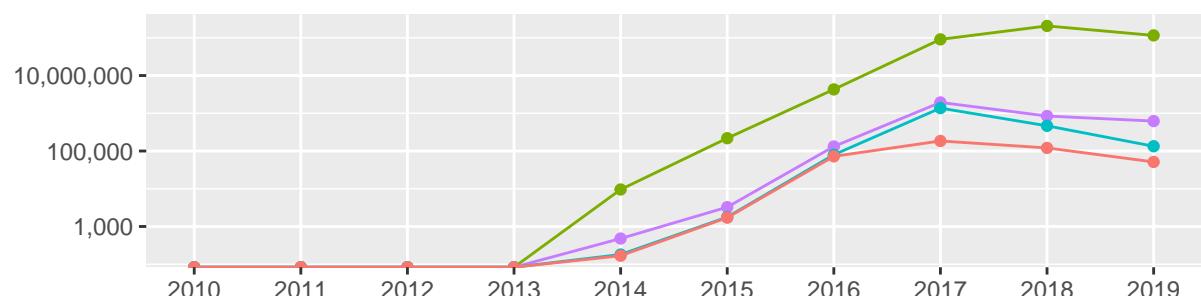
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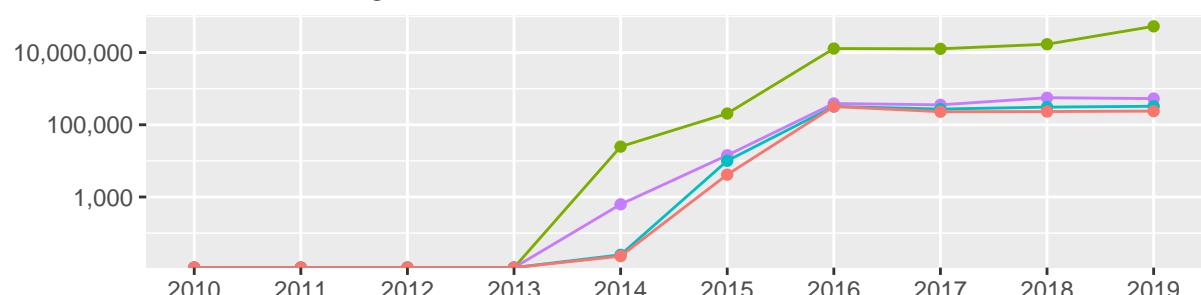
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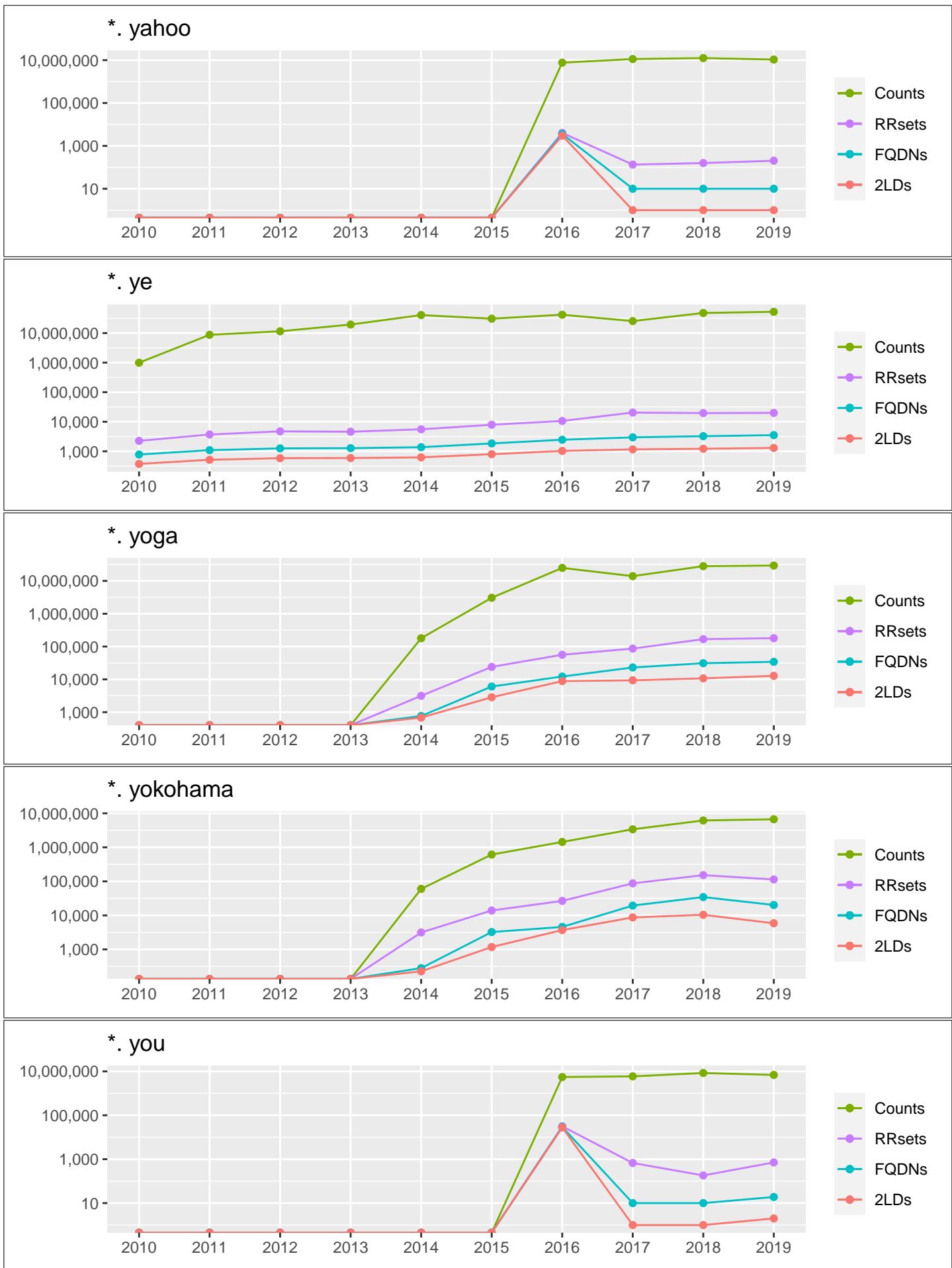


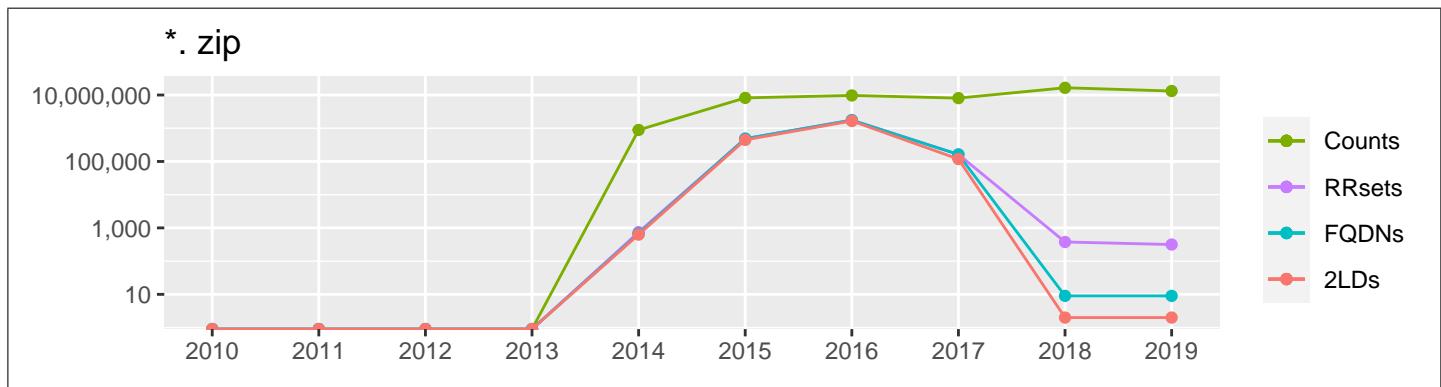
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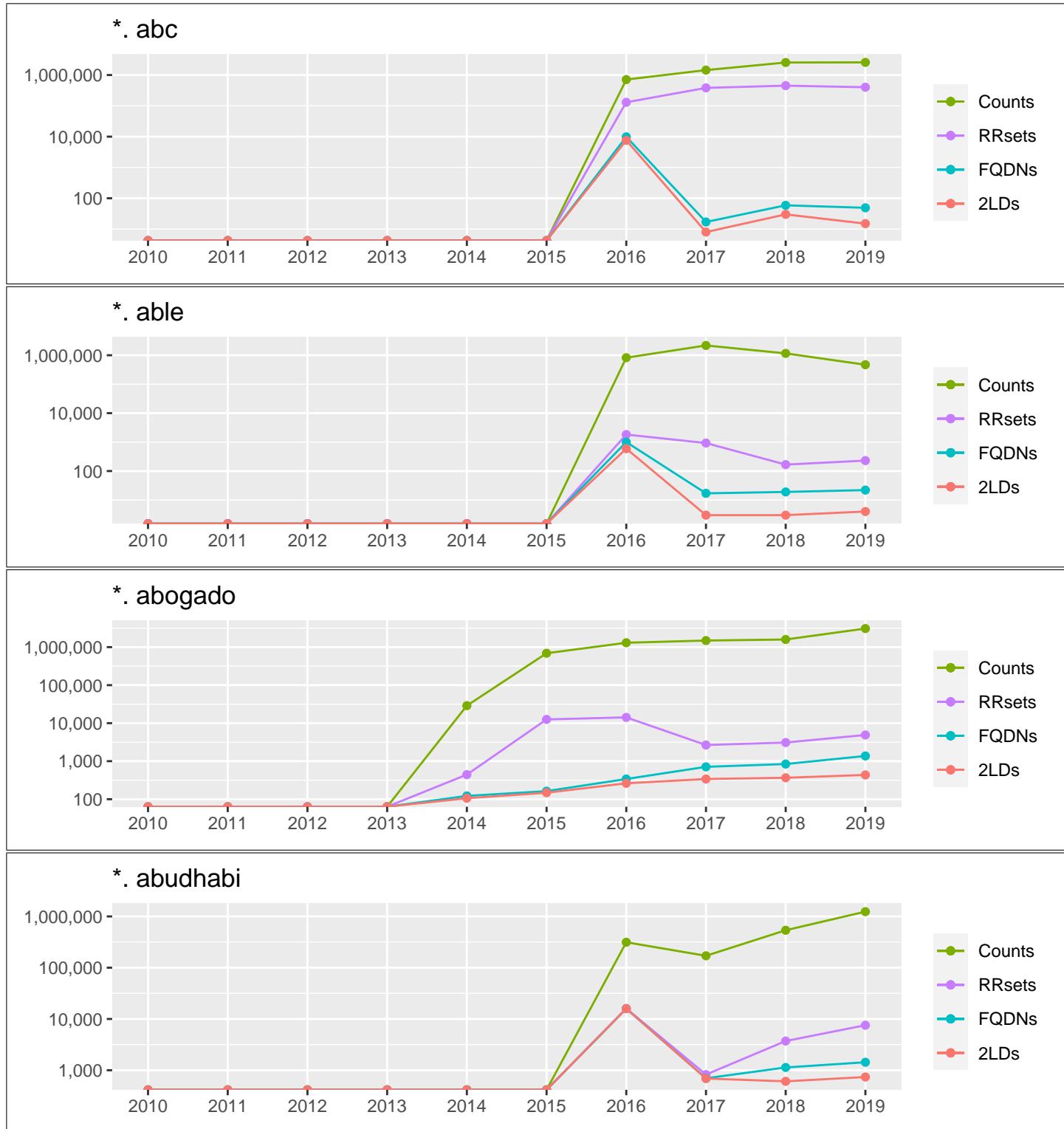


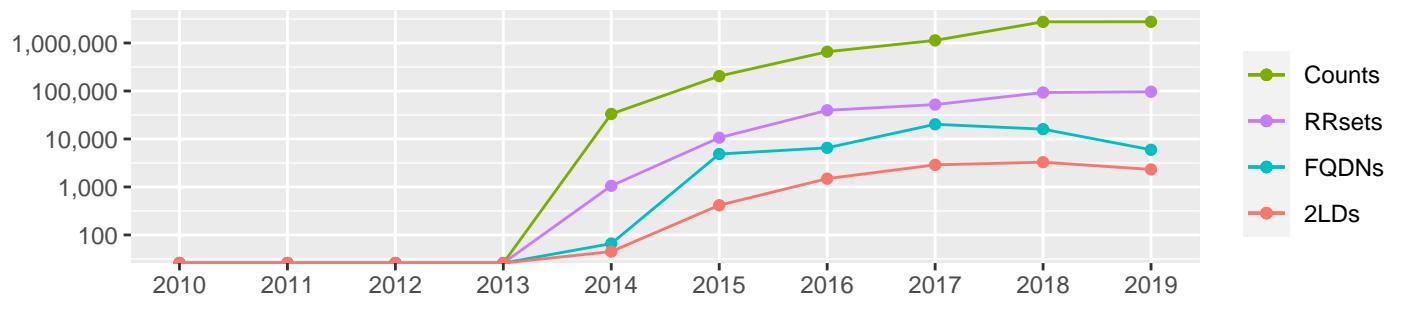
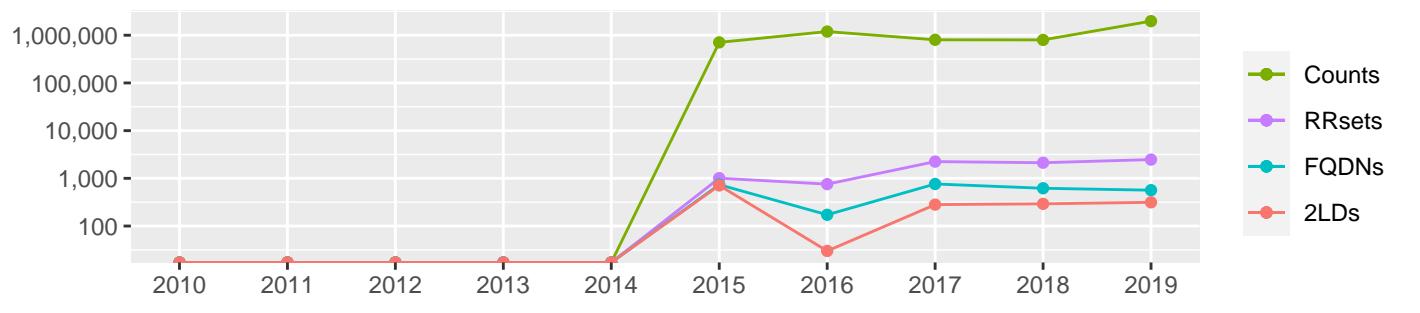
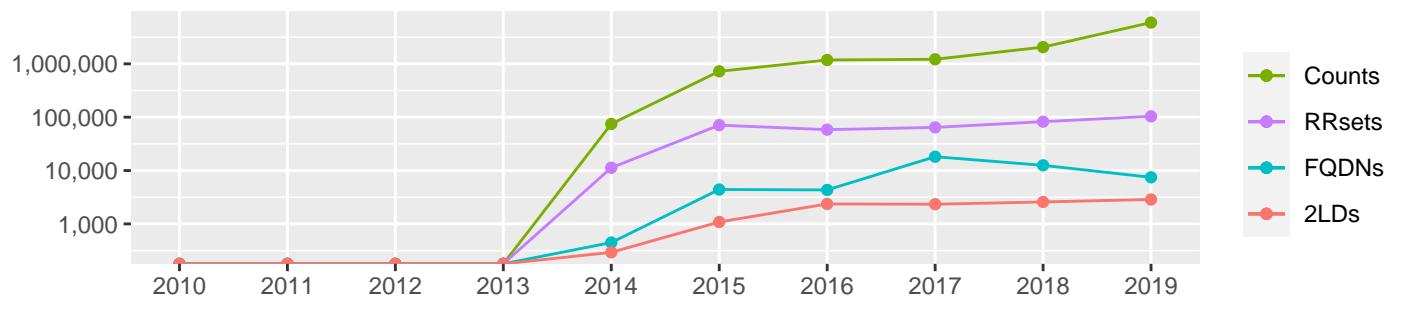
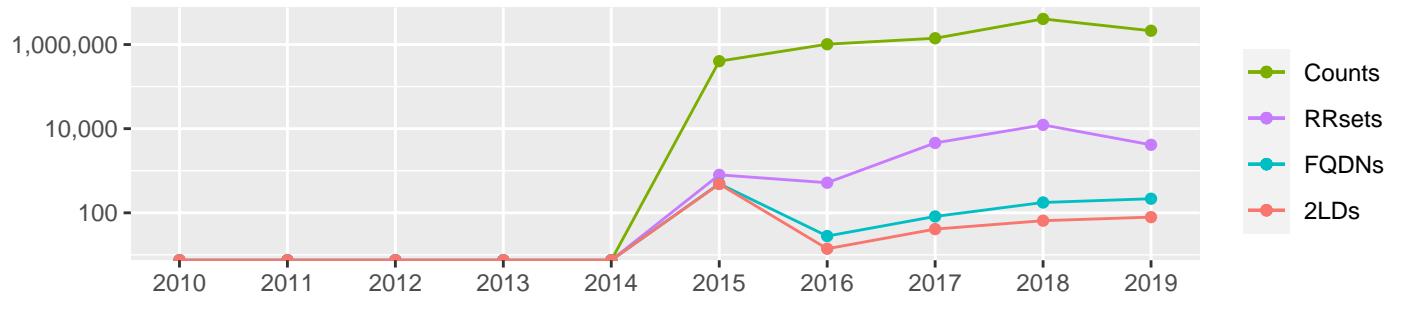
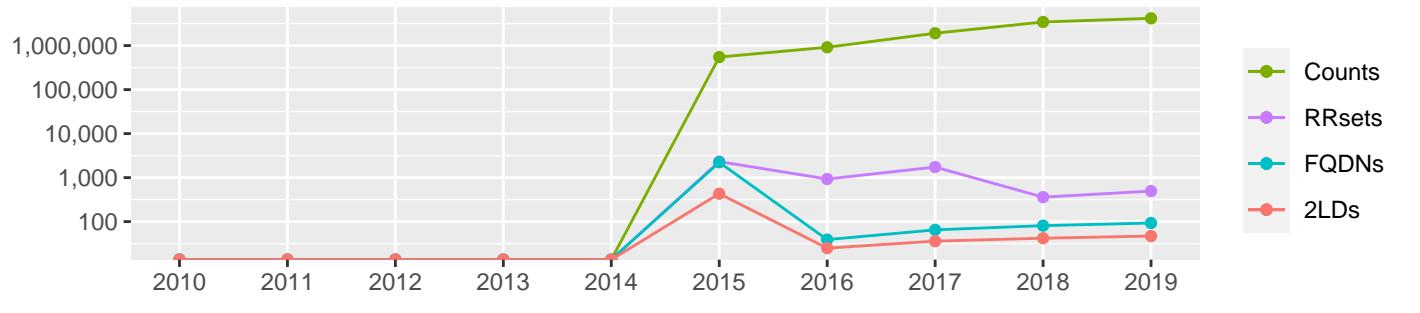


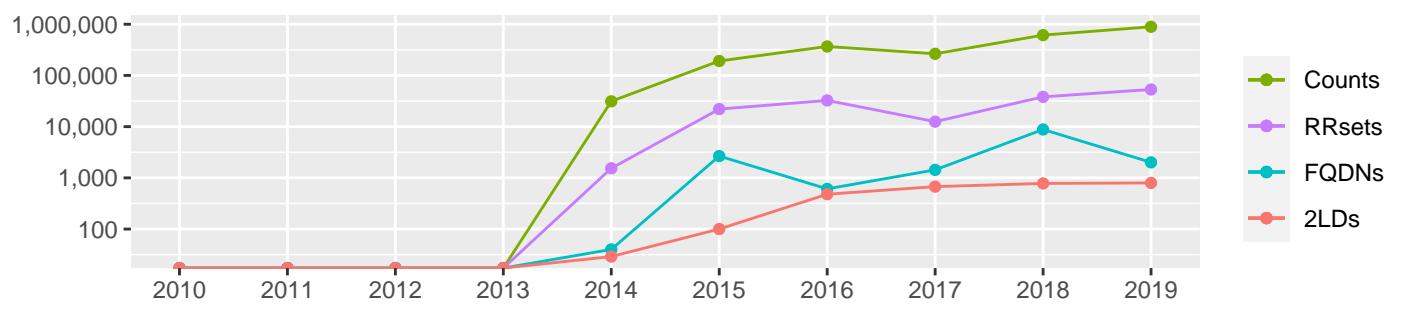
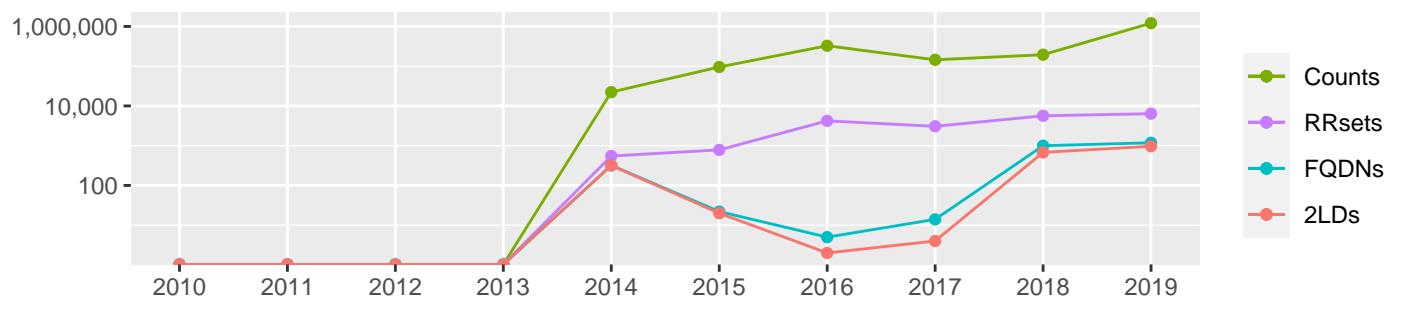
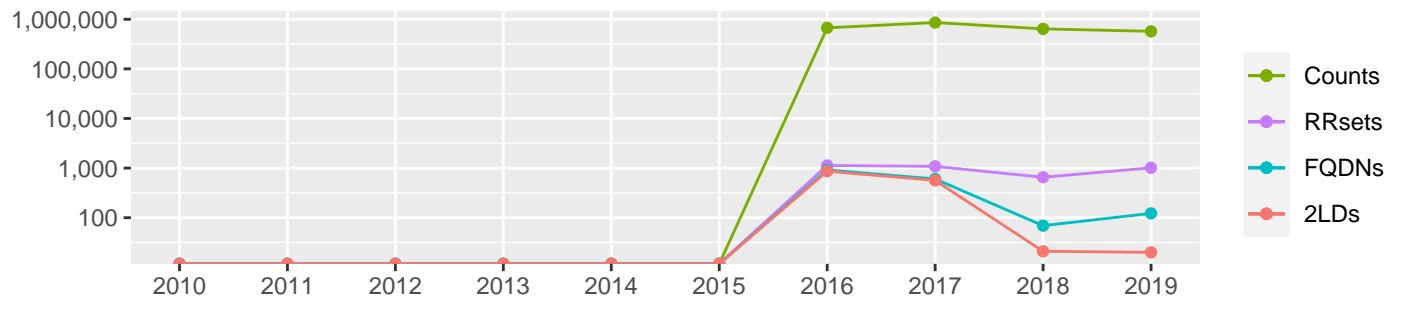
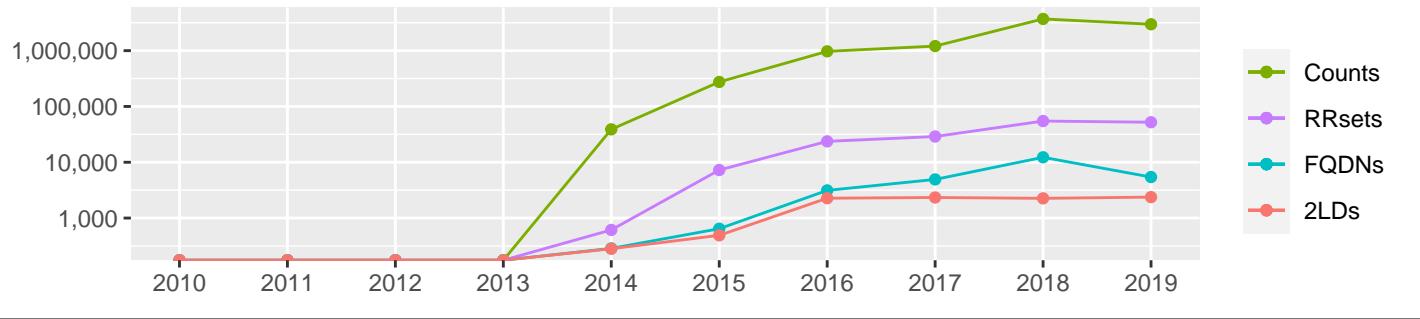
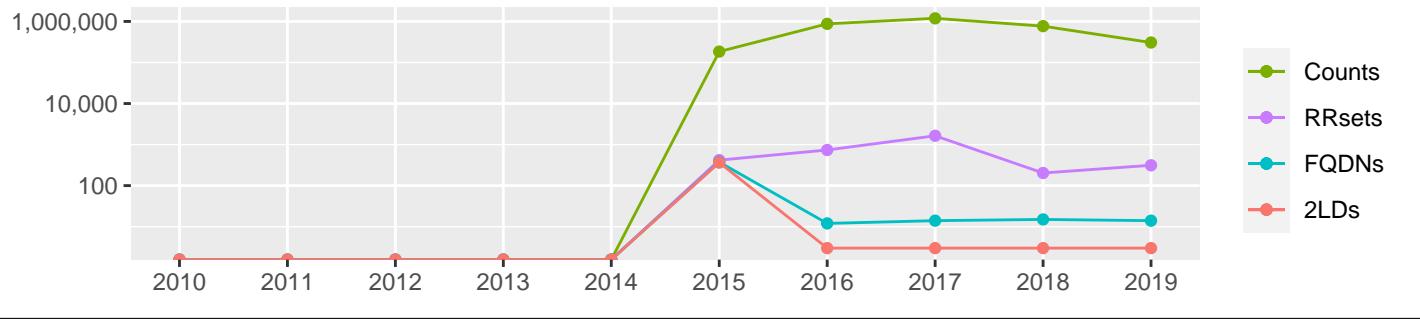


Chapter 8

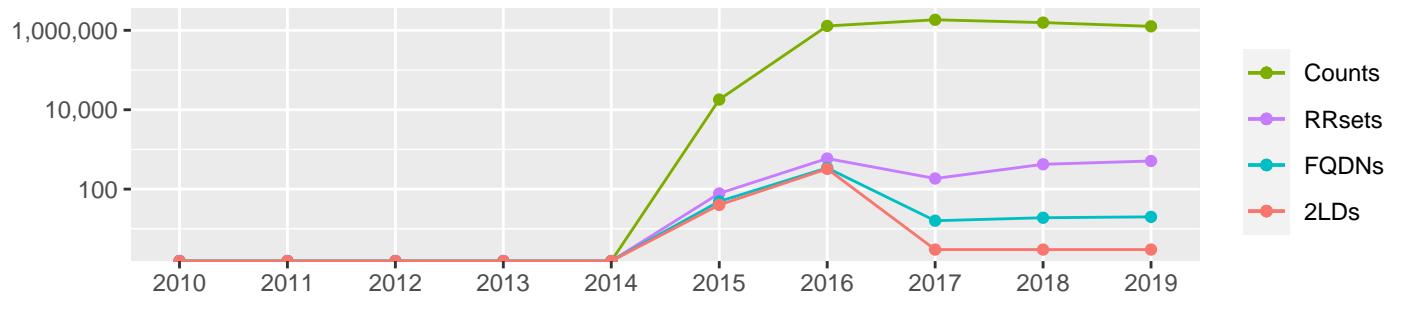
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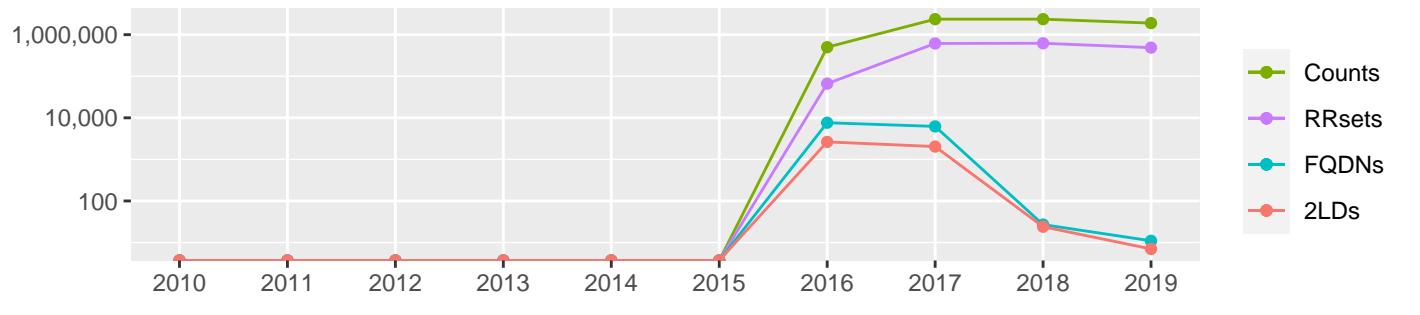
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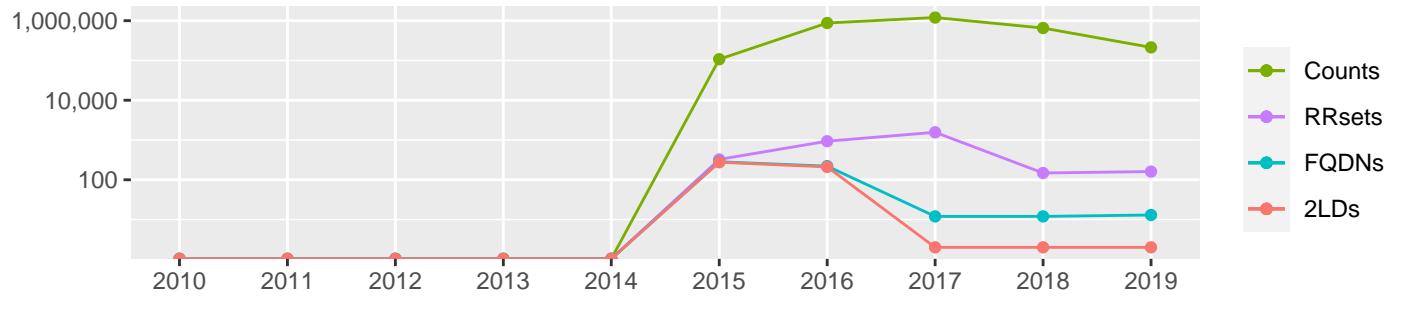
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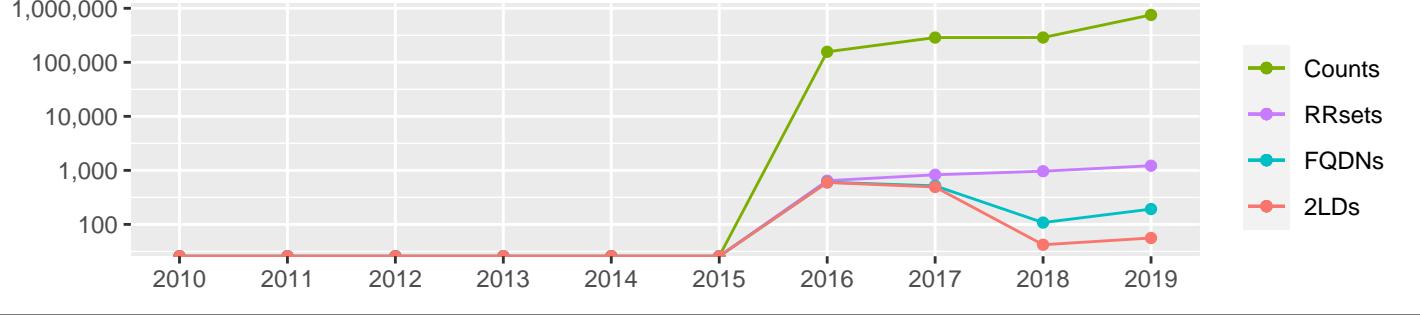
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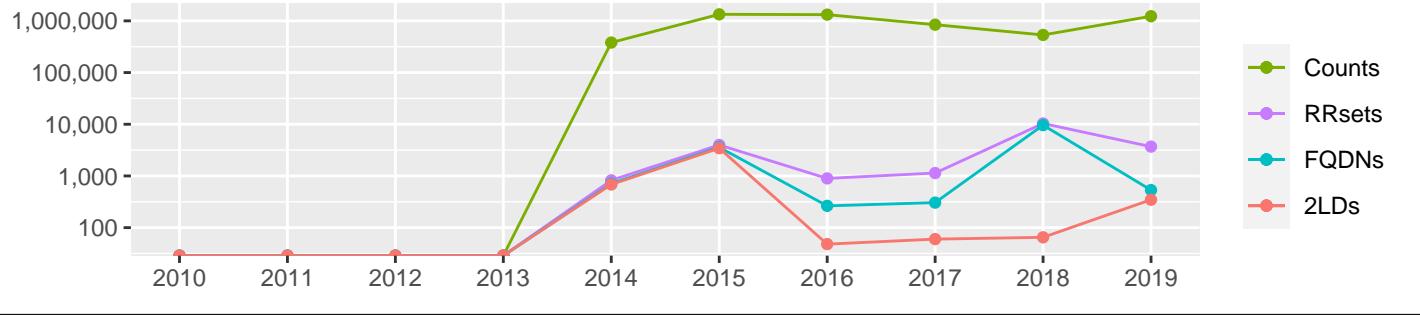
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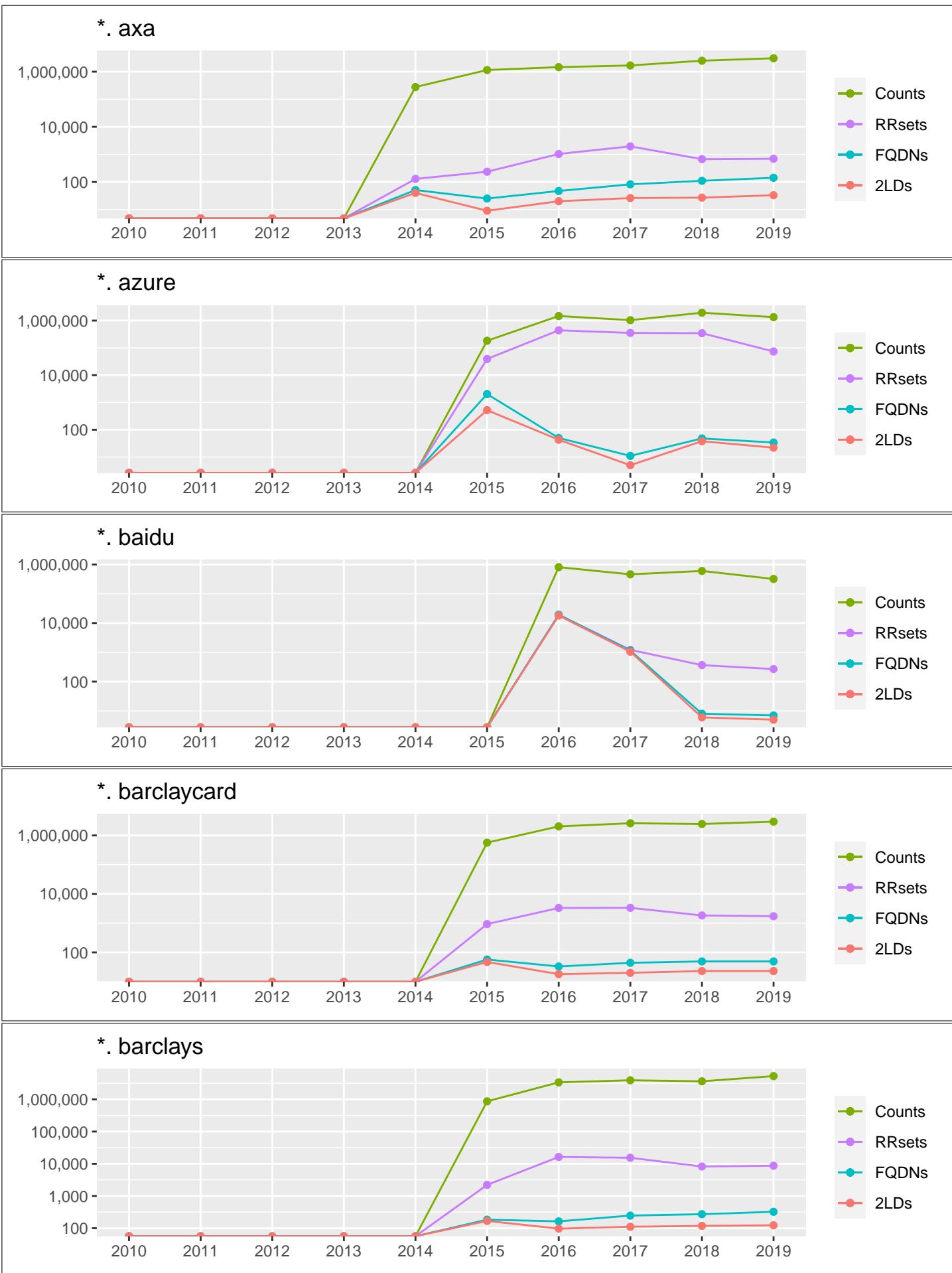


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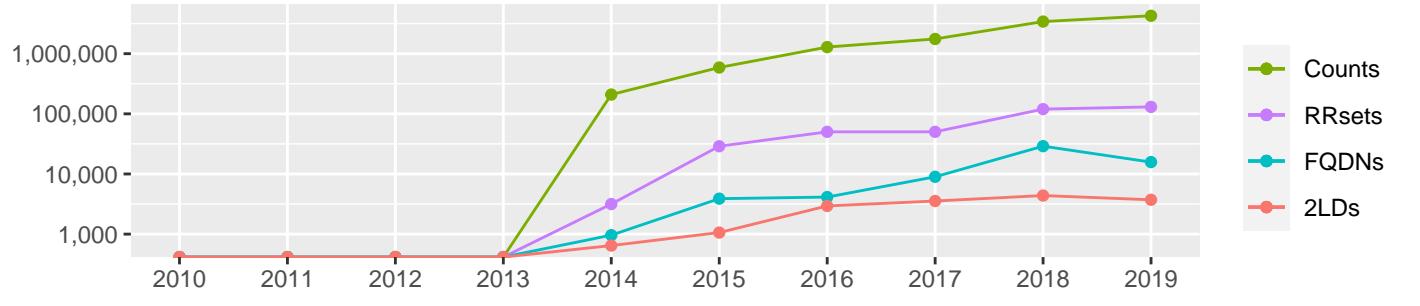


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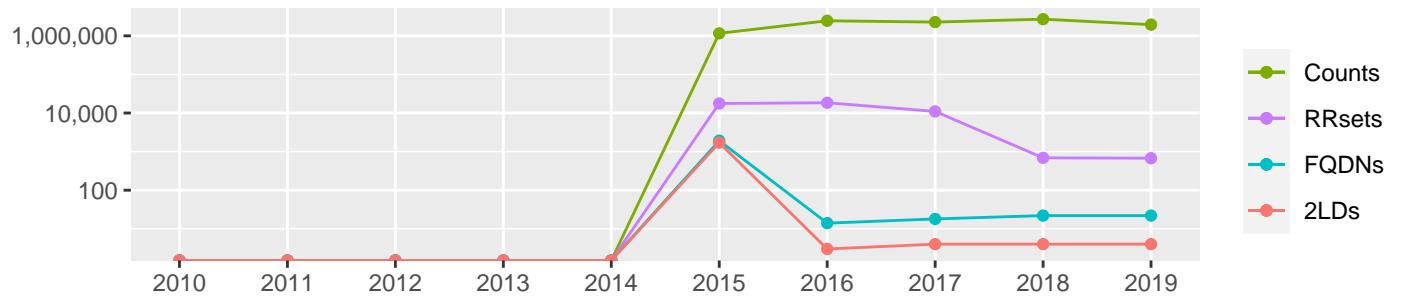




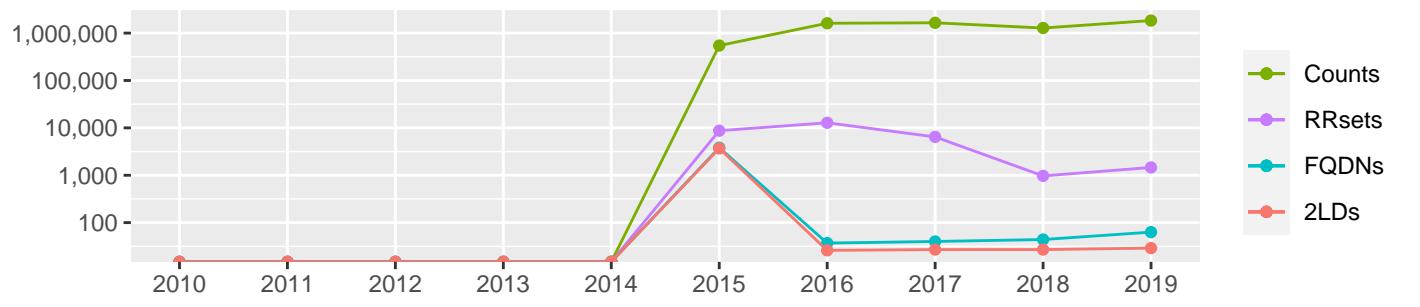
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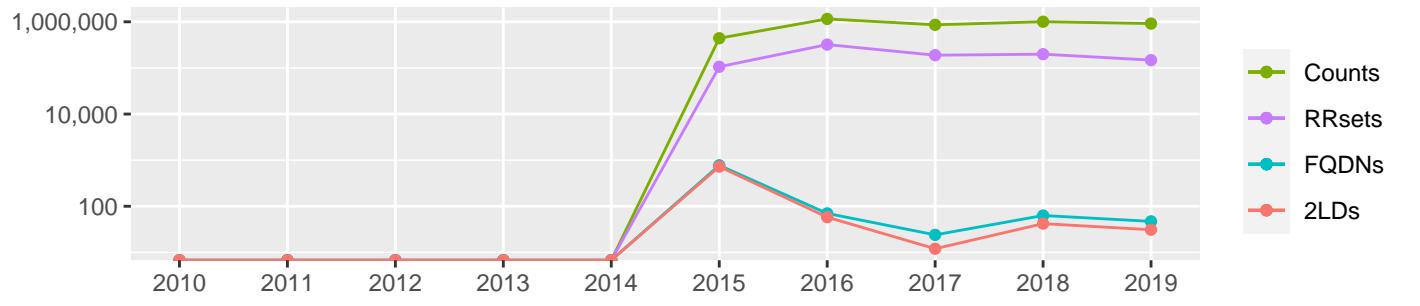
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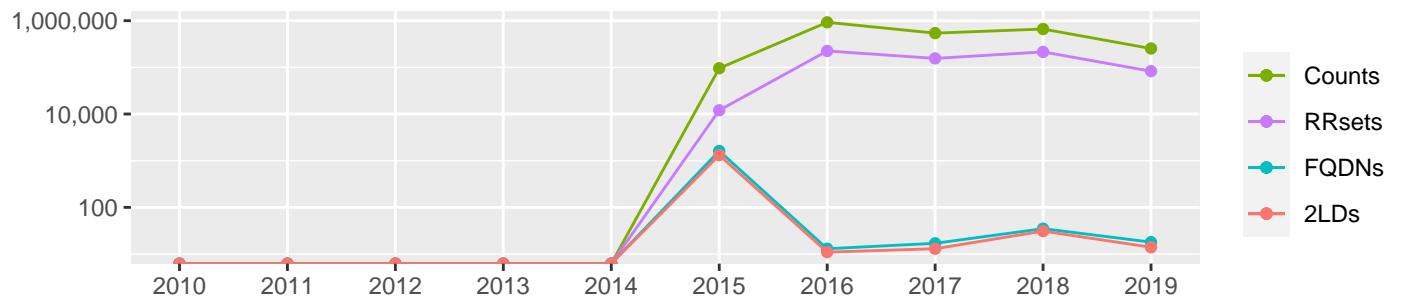
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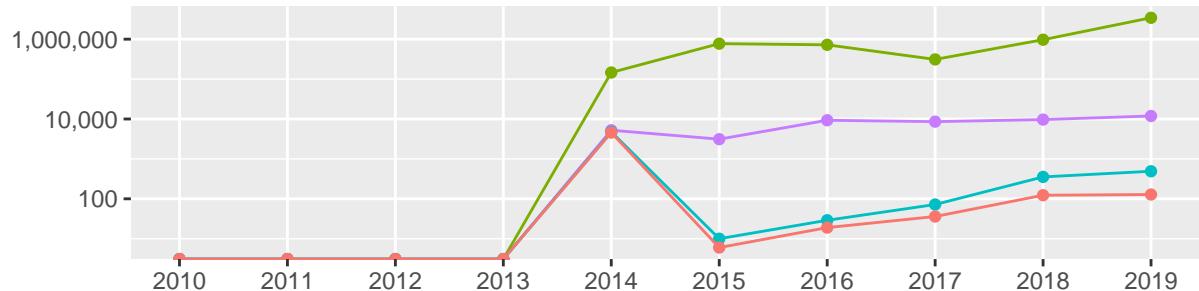
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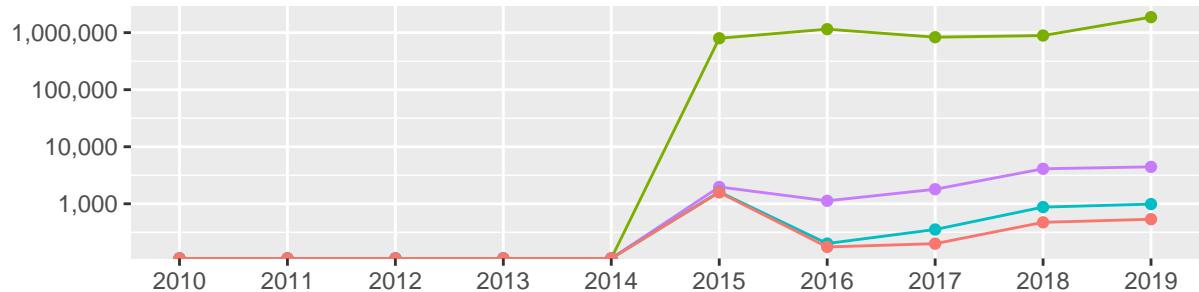
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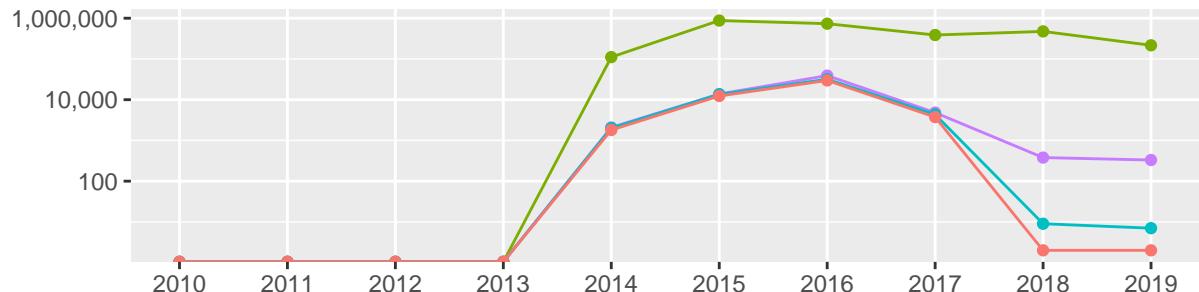
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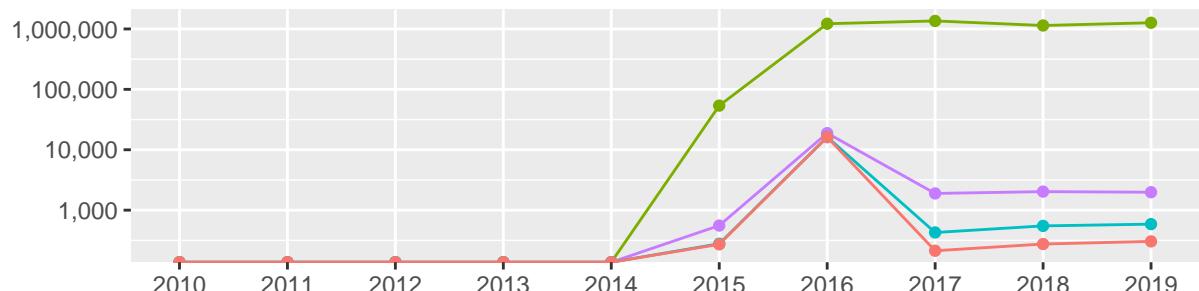
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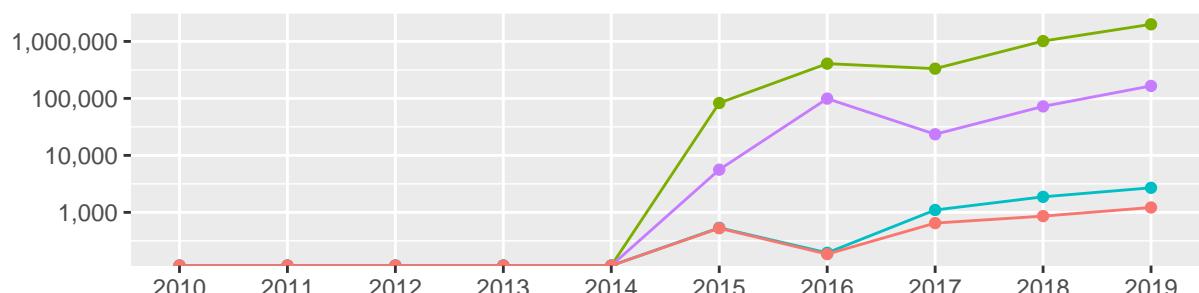
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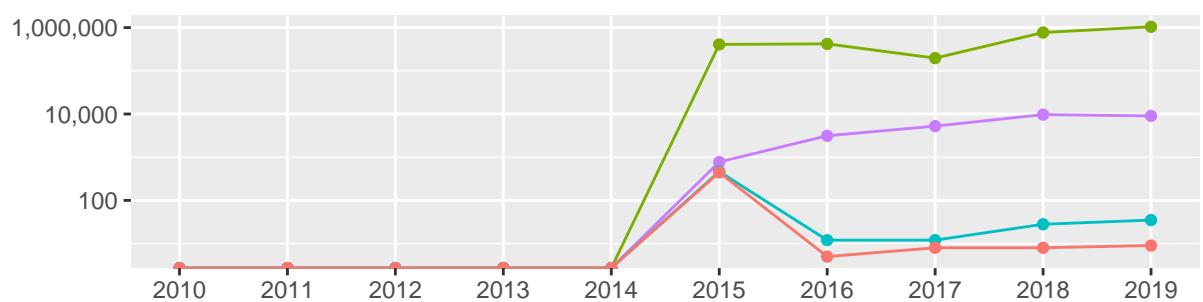
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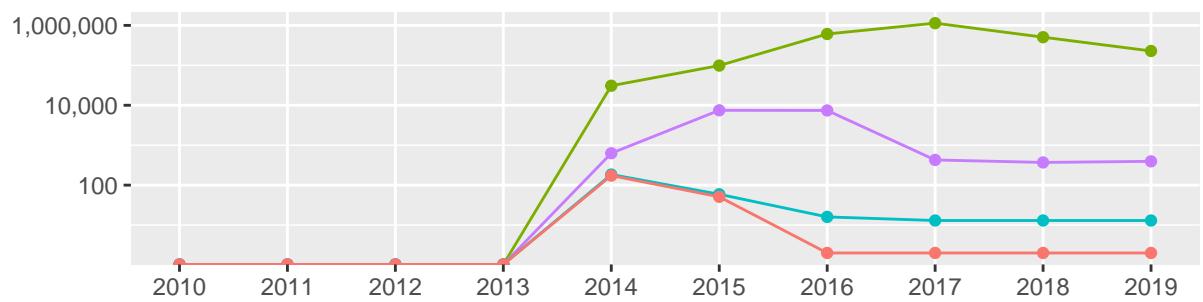
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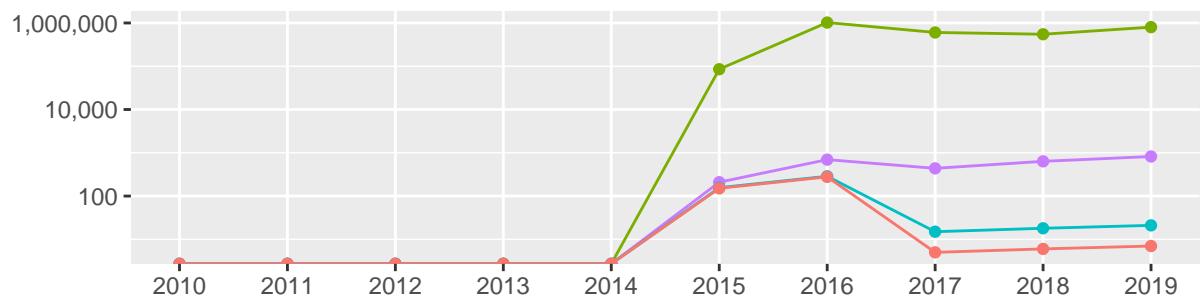
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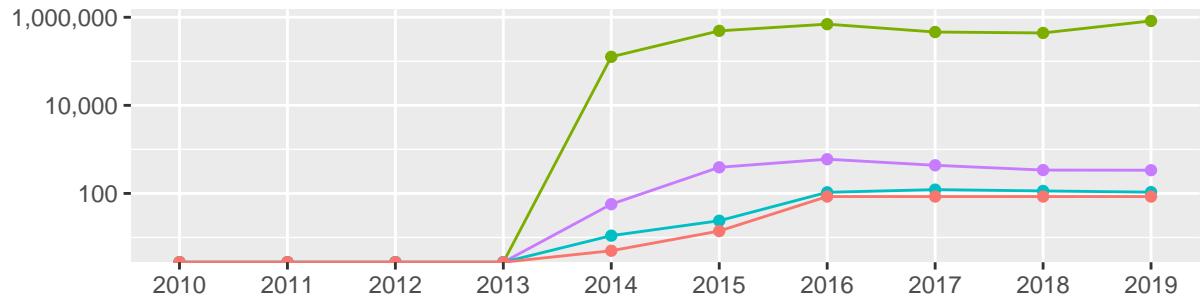
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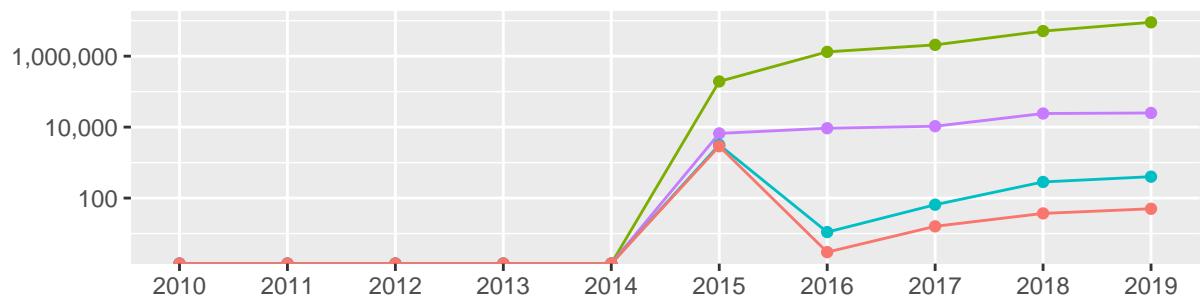
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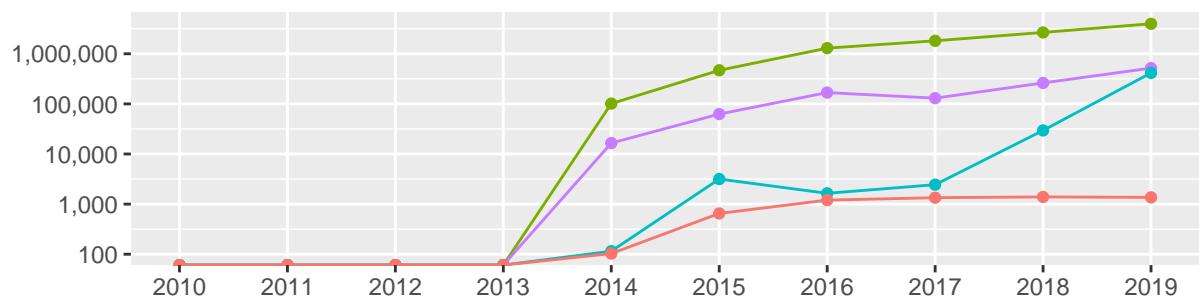
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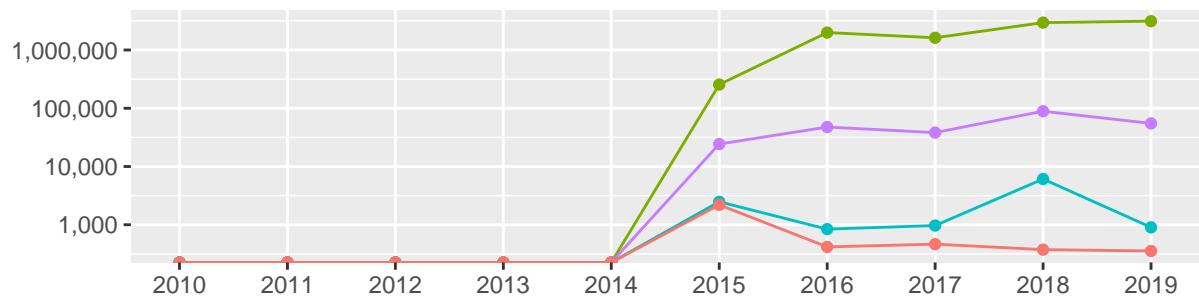
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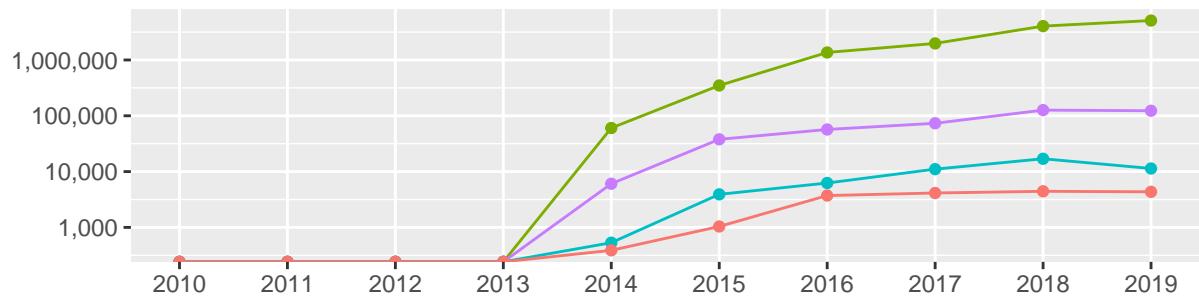
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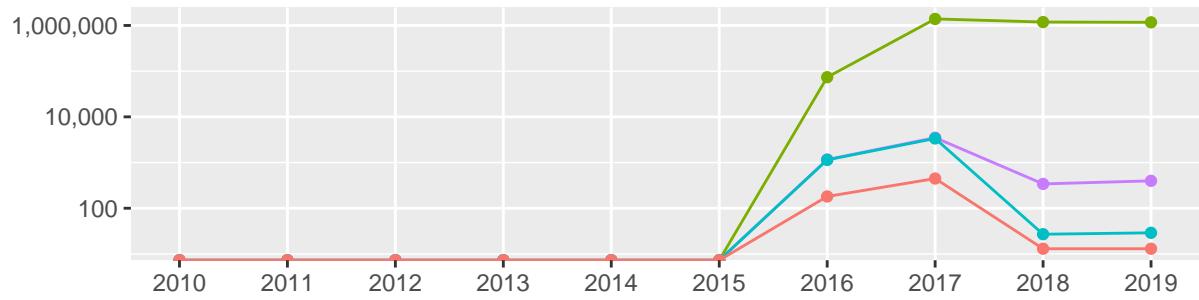
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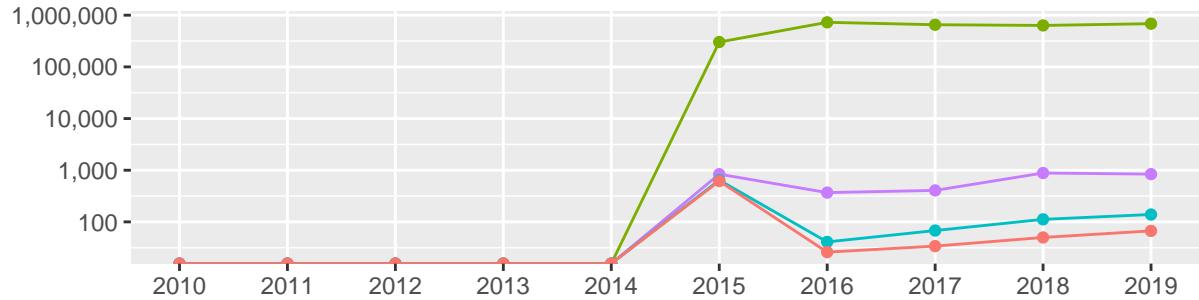
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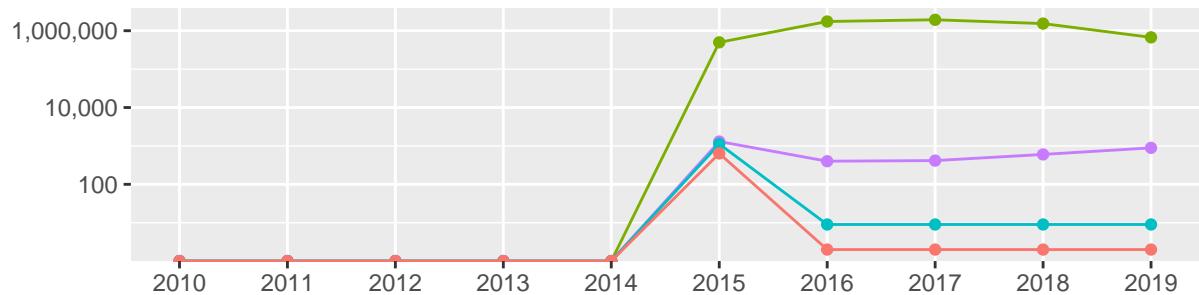
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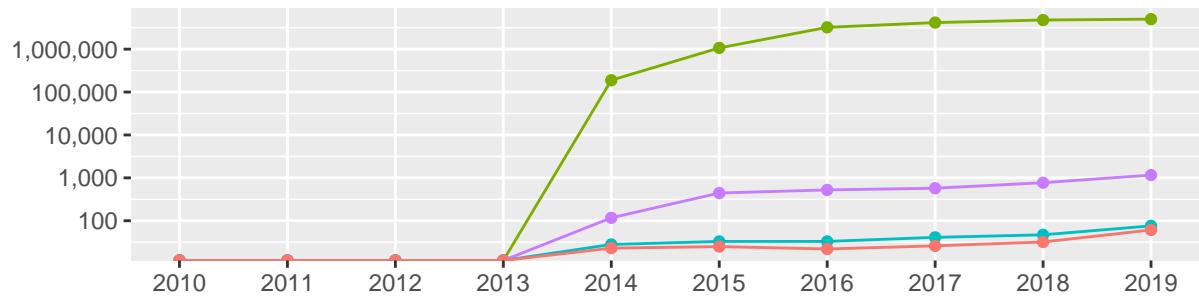
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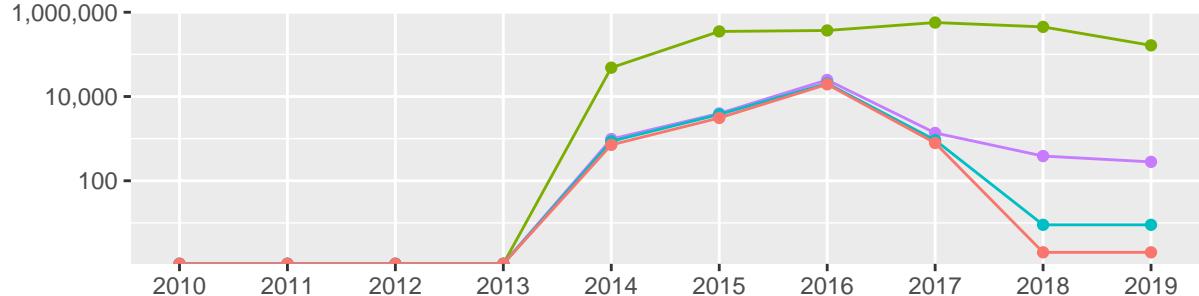
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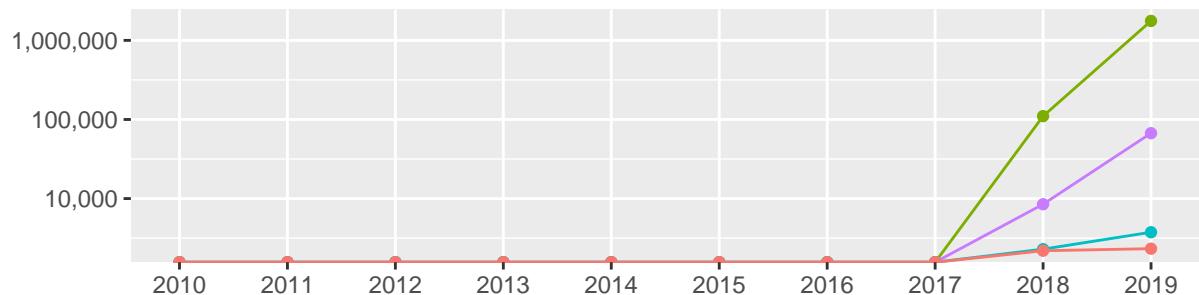
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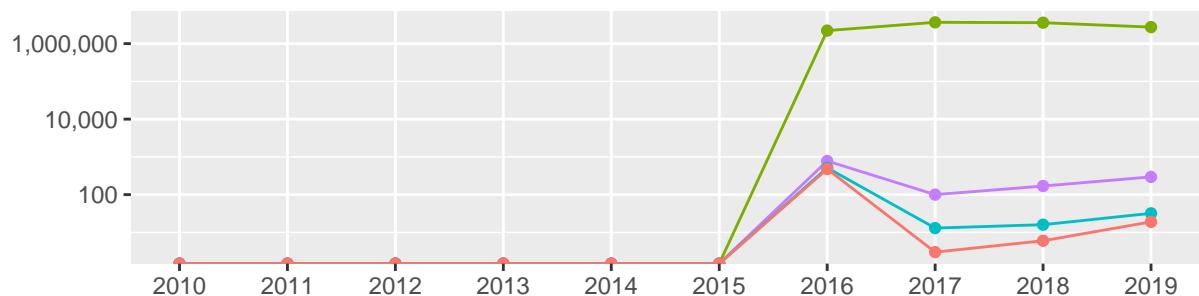
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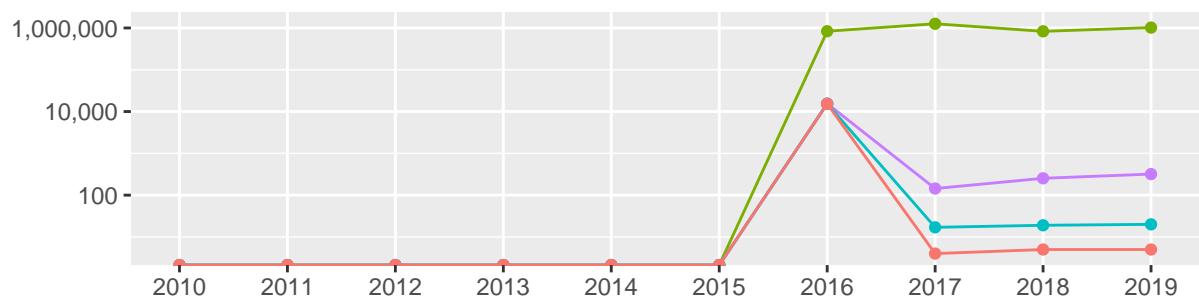
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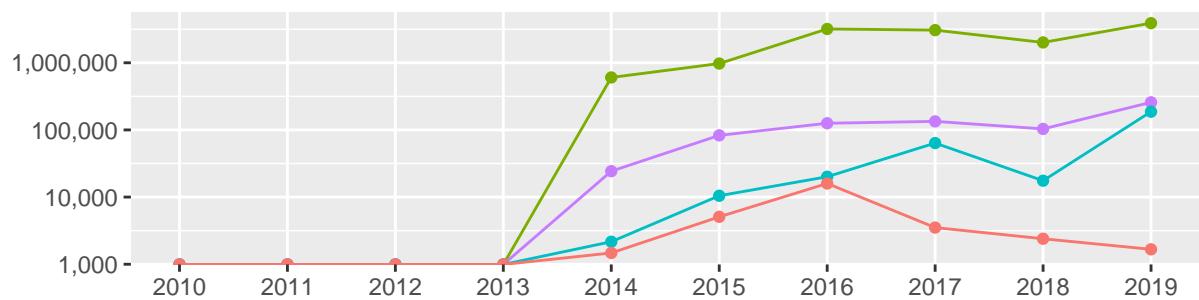
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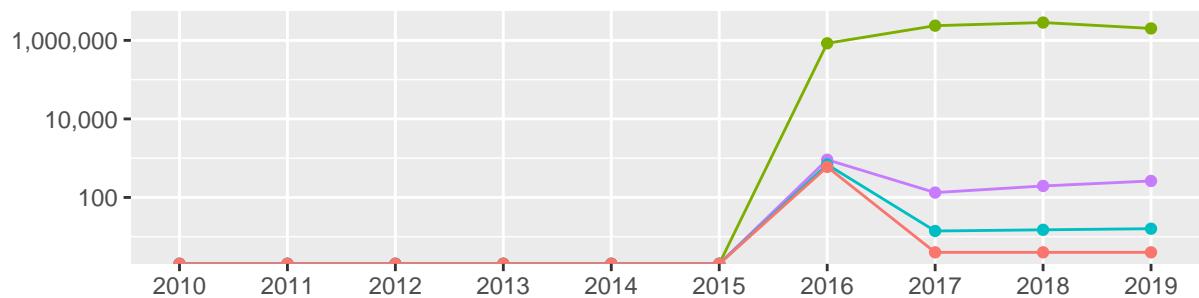
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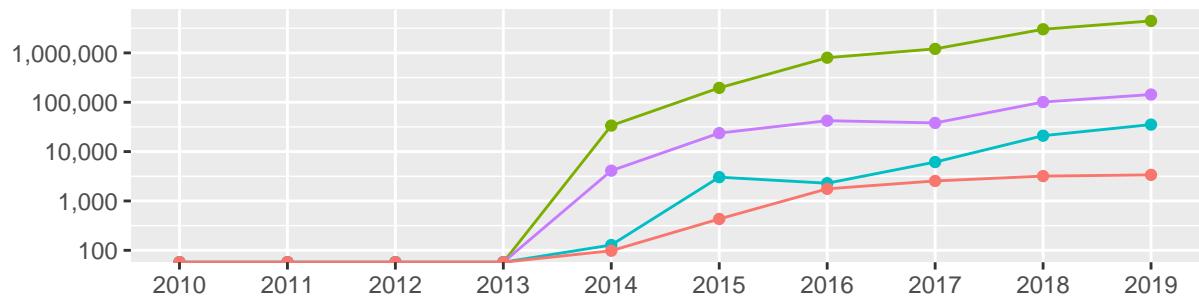
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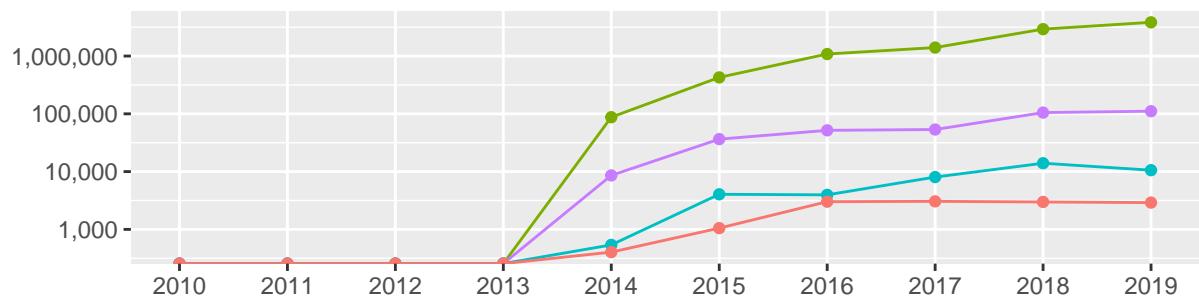
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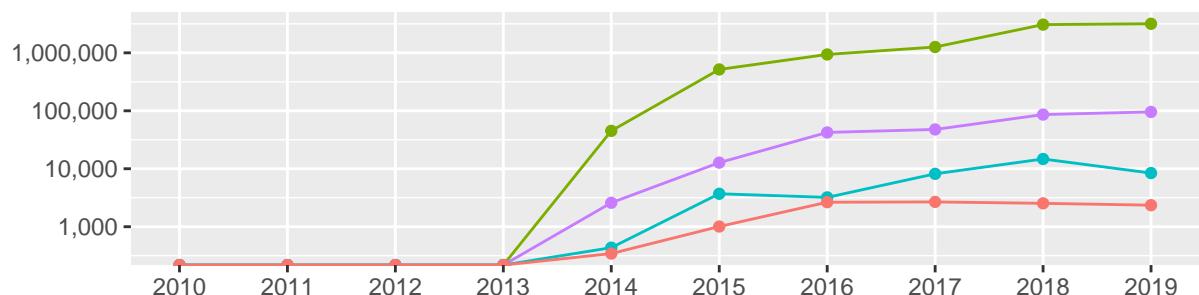
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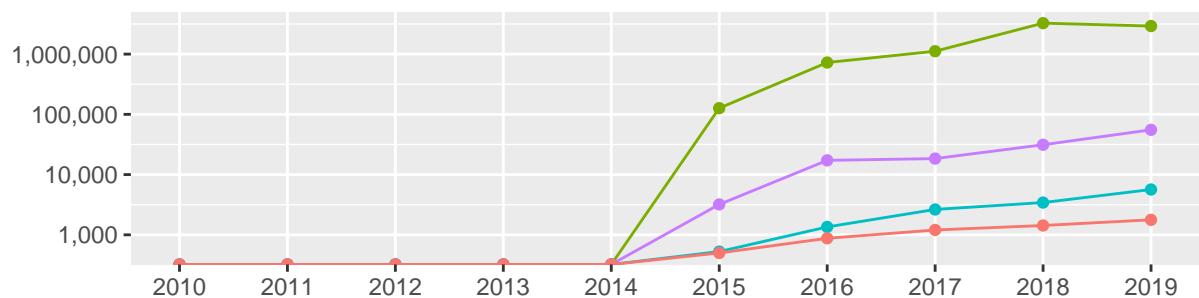
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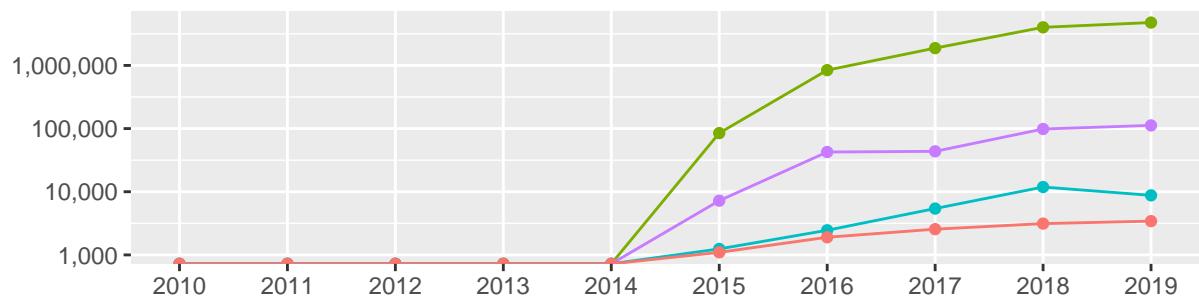
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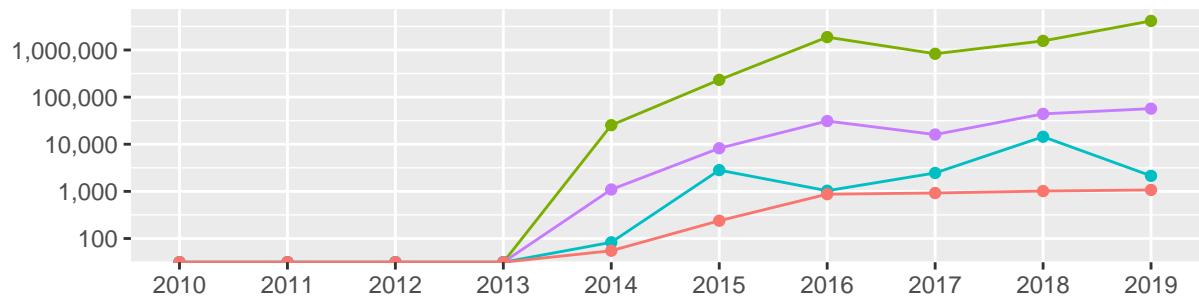
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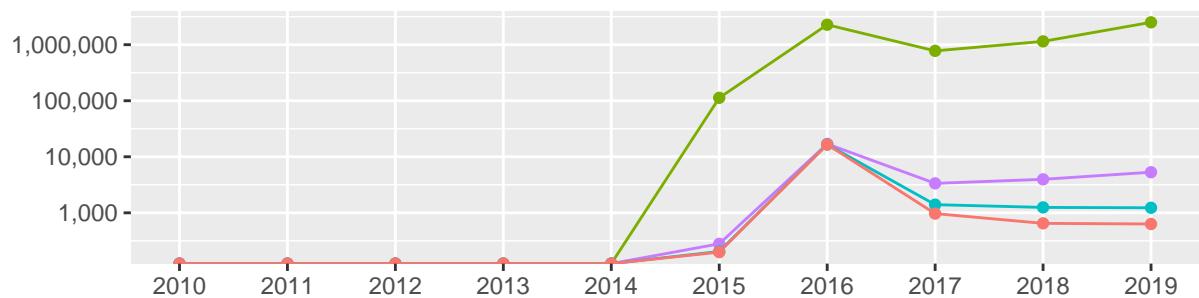
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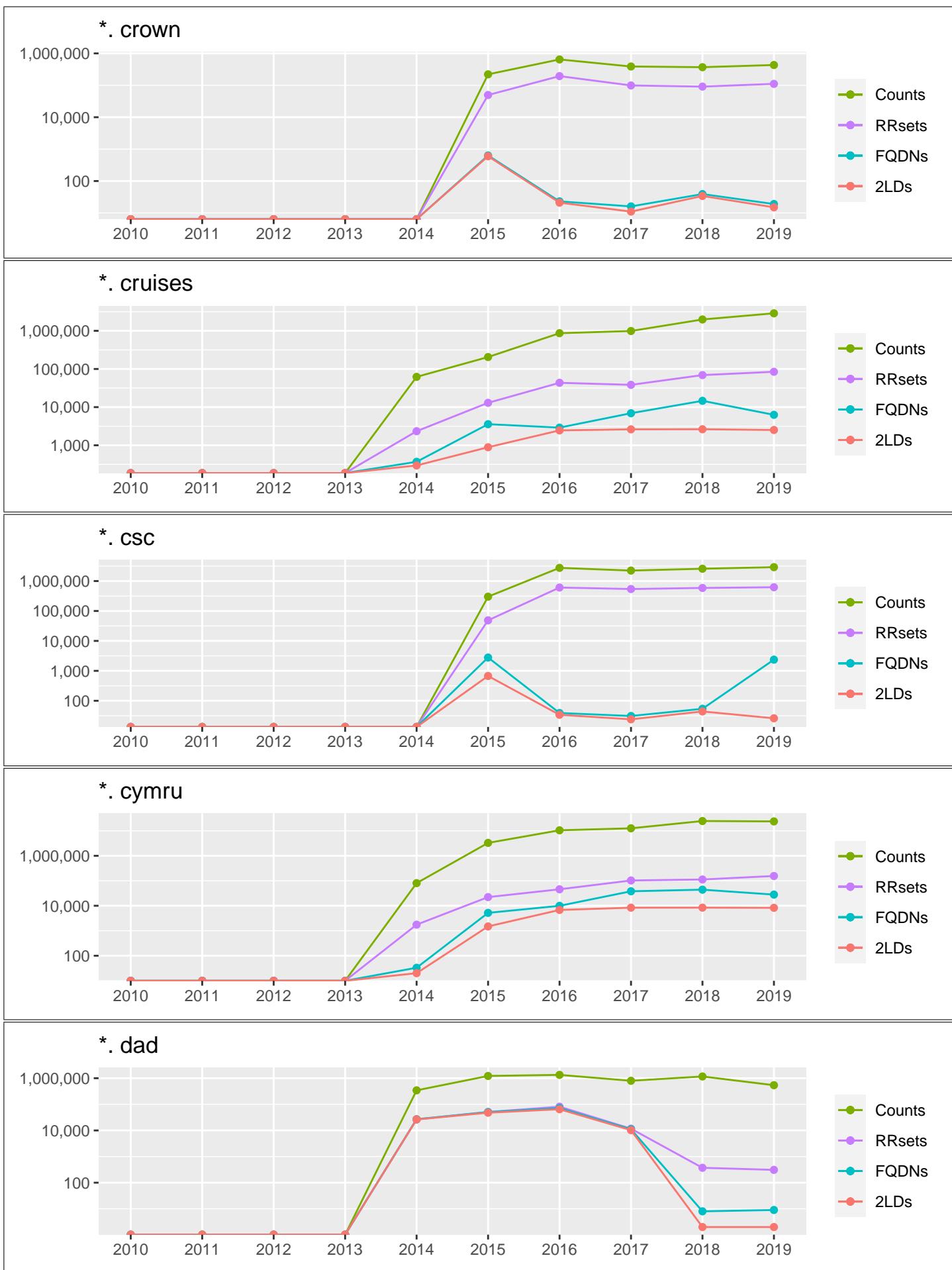


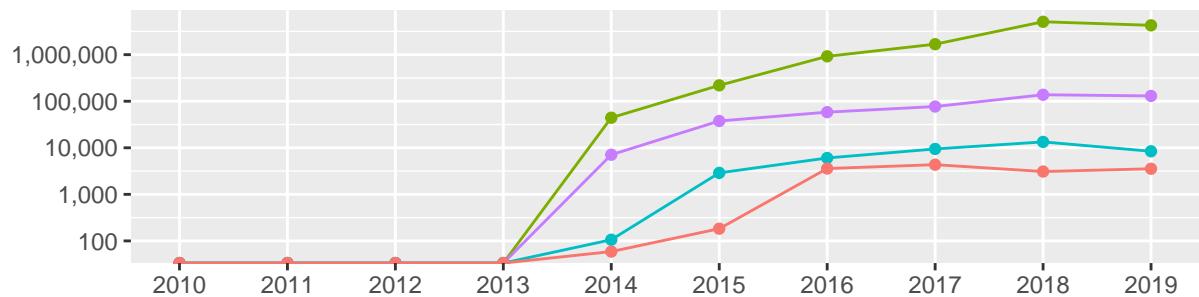
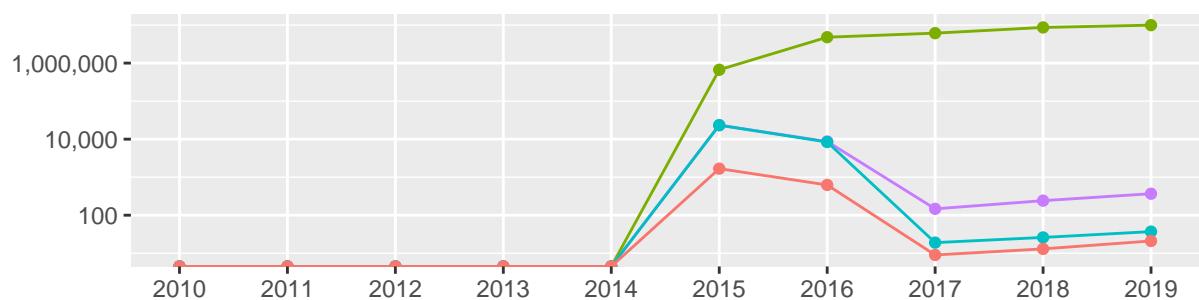
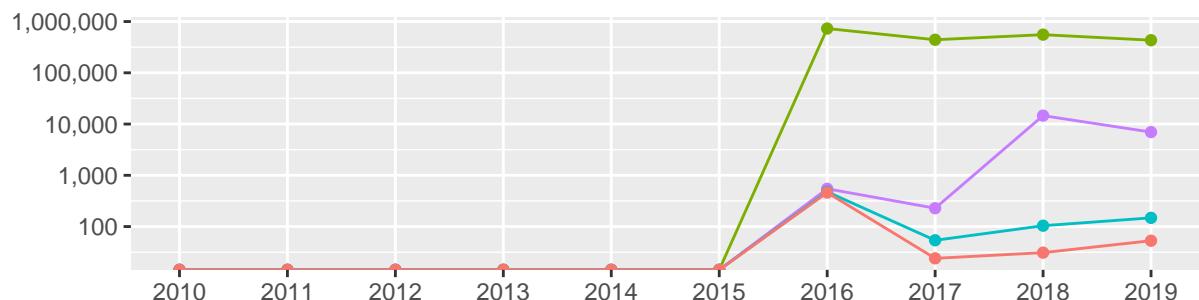
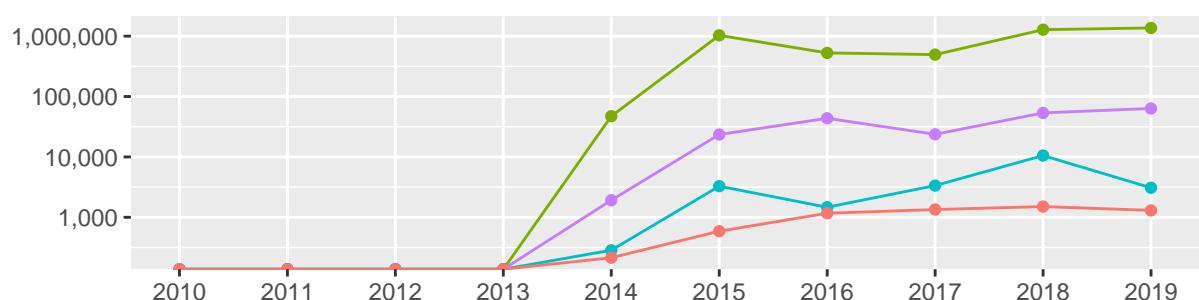
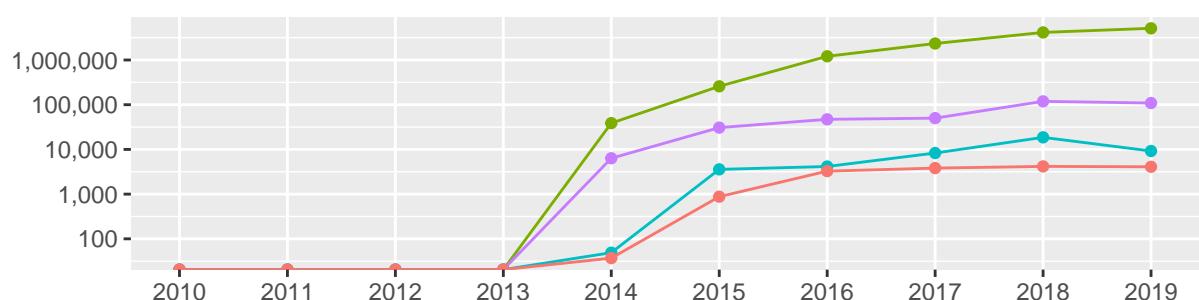
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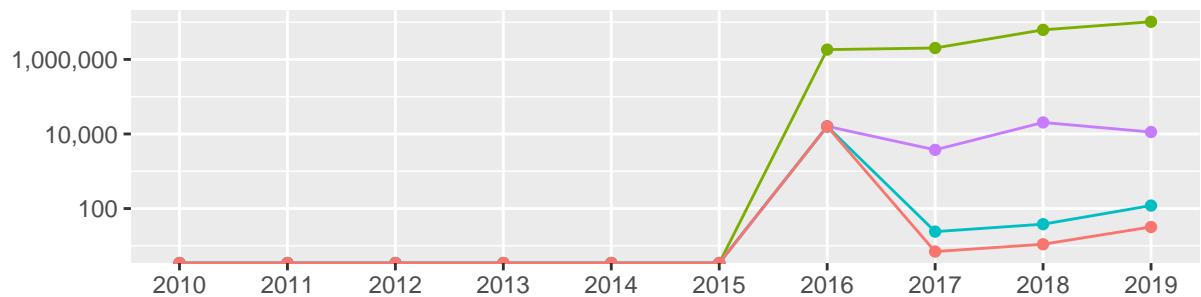
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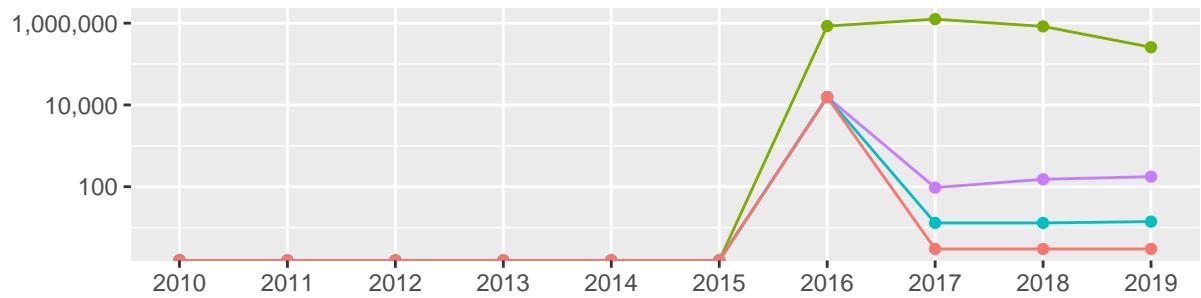


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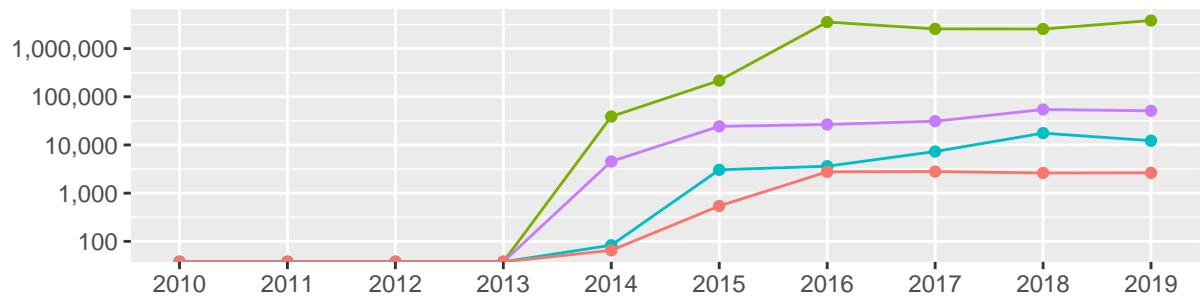
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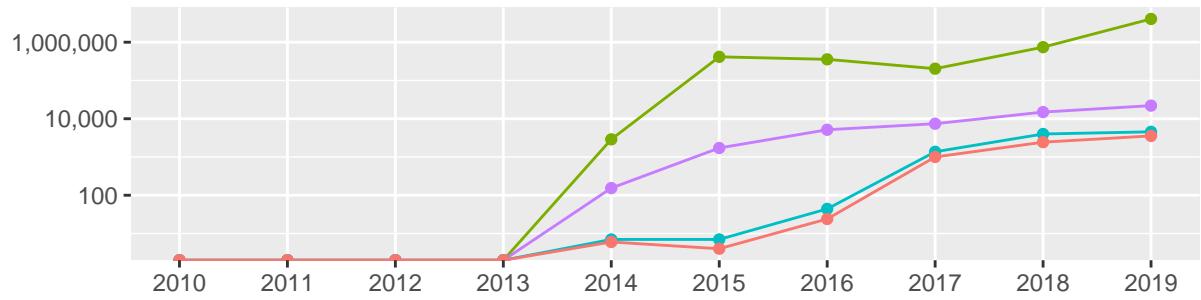
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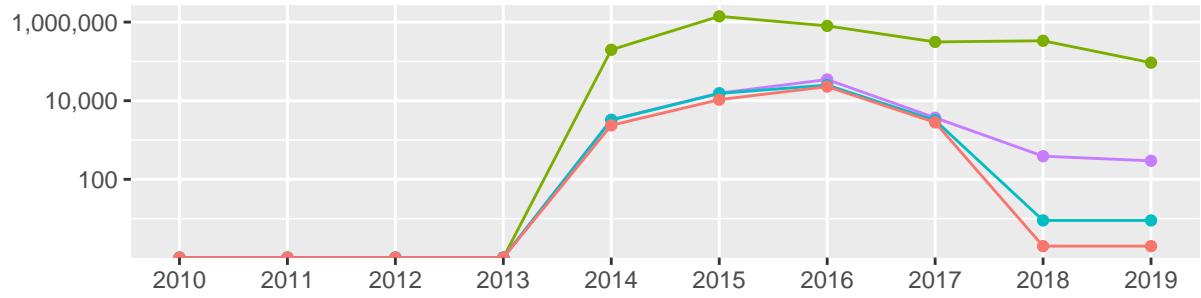
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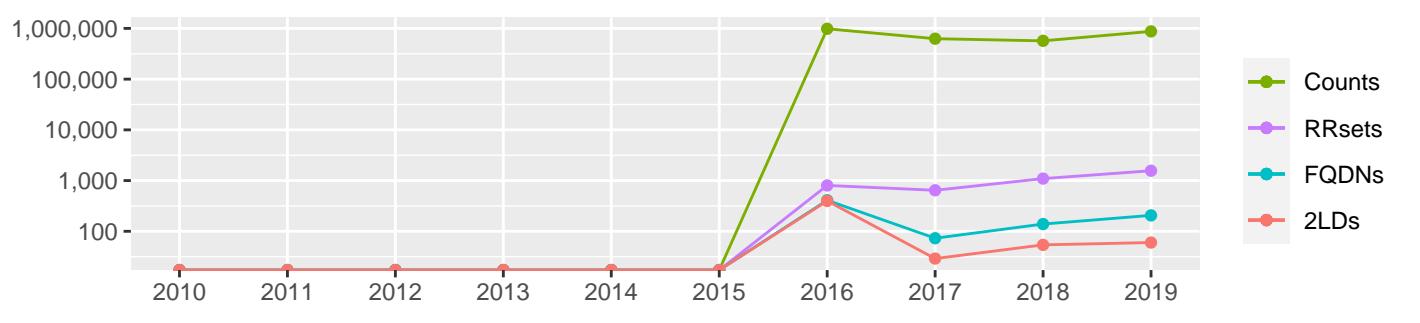
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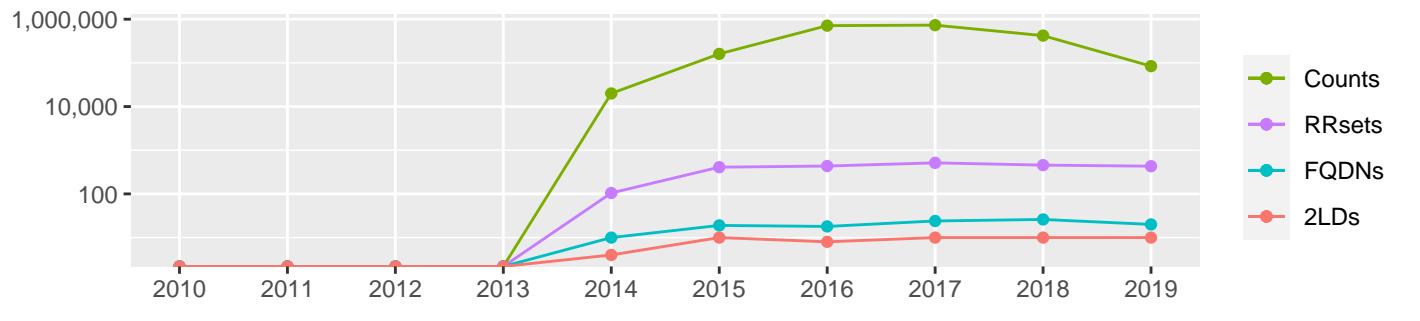
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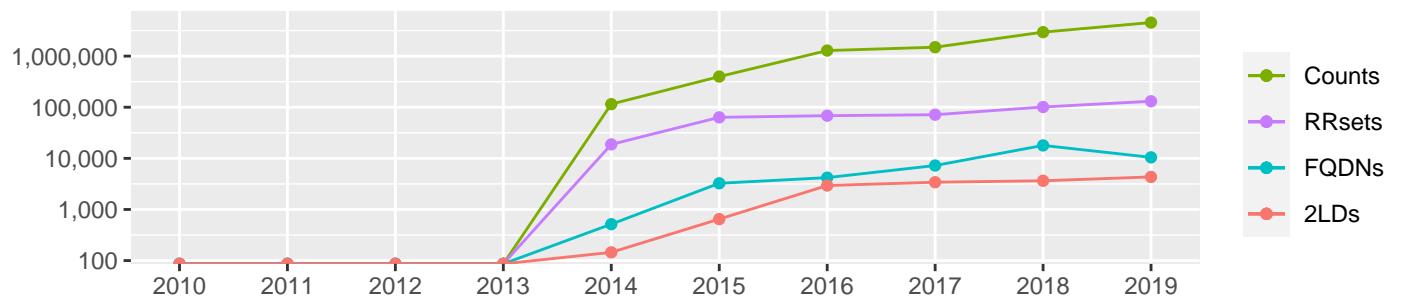
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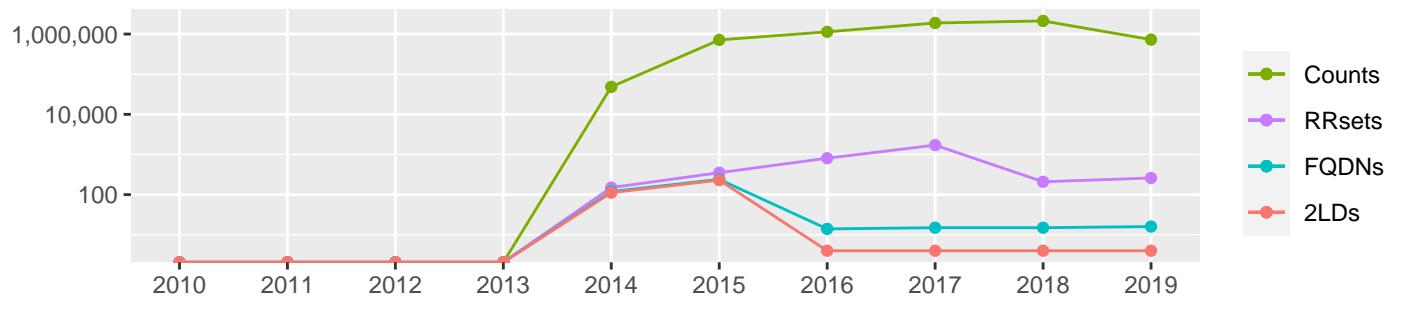
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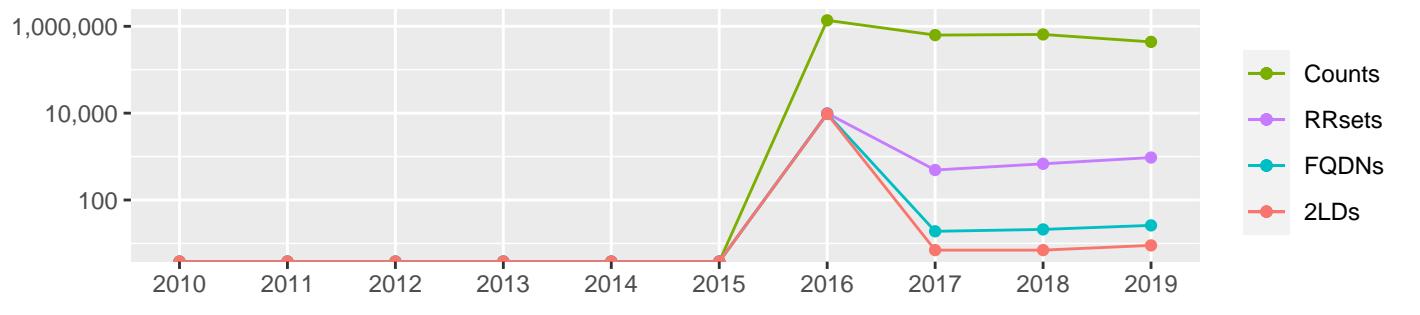
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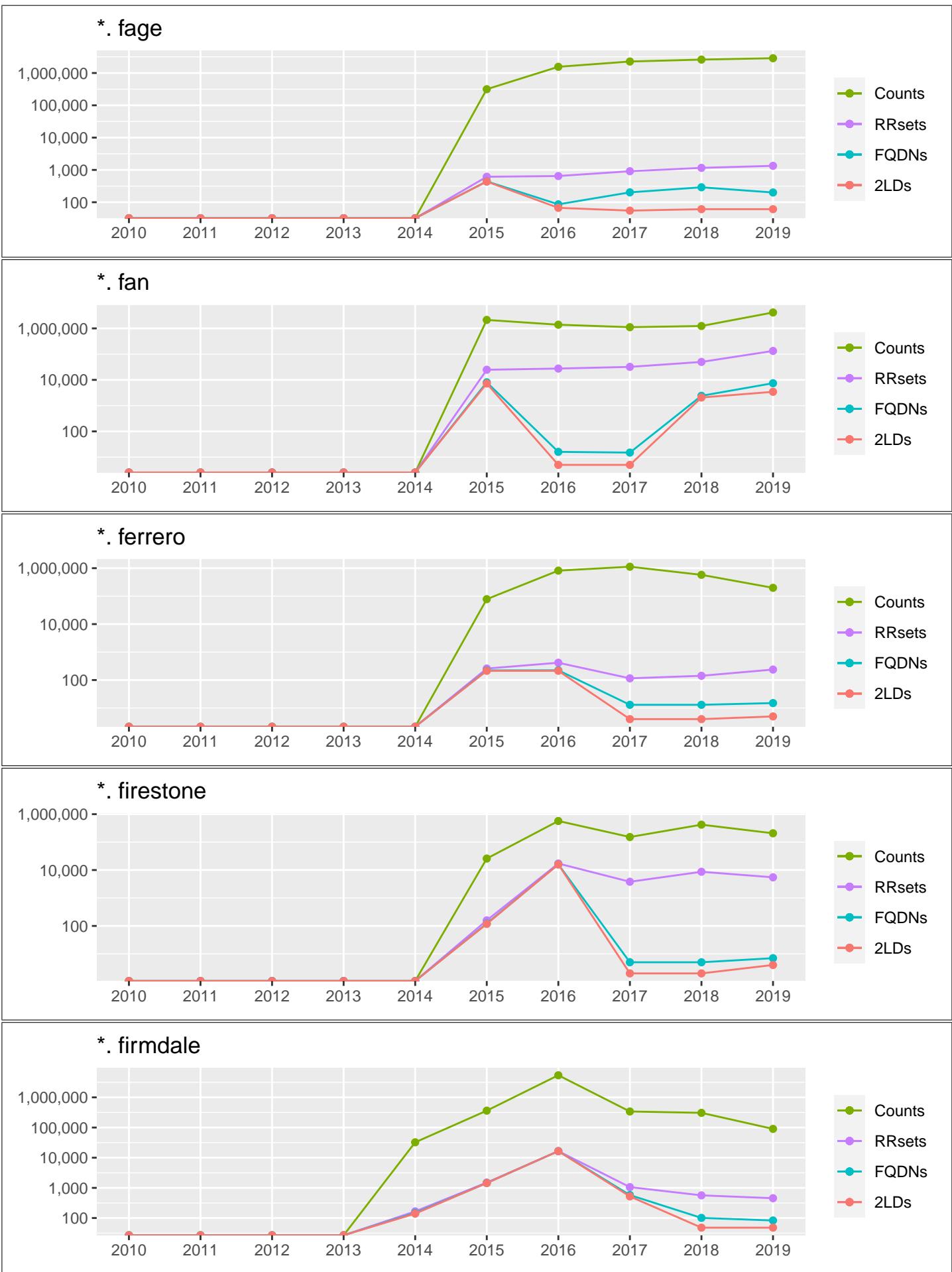


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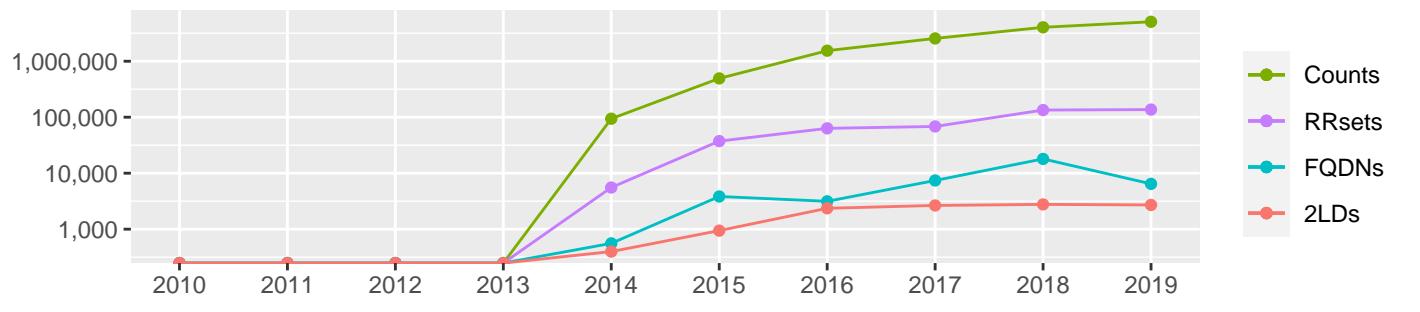


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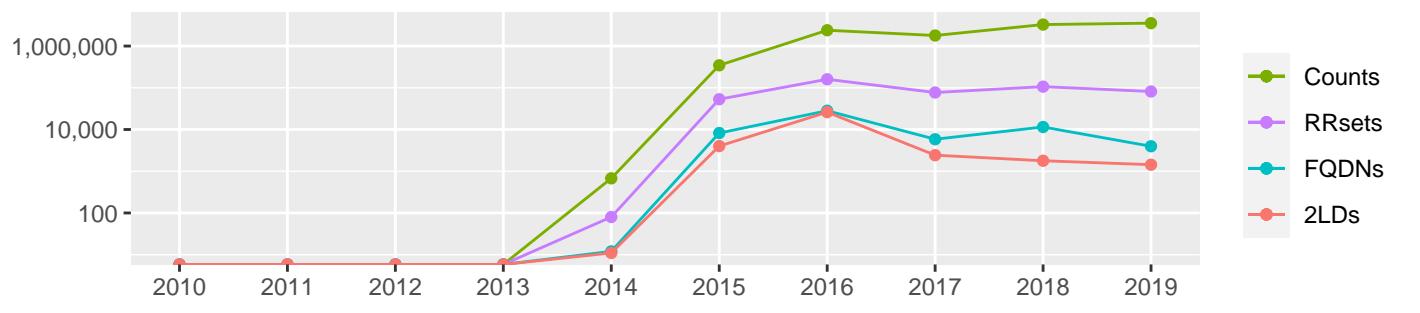




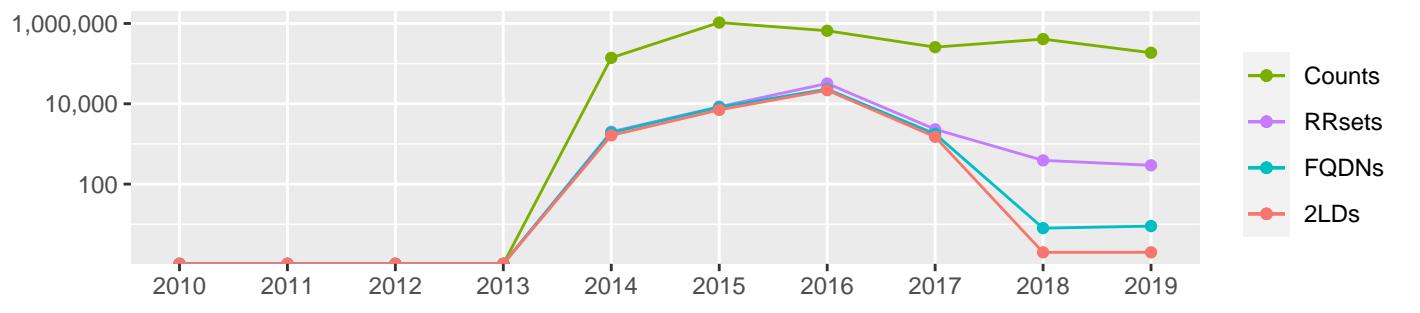
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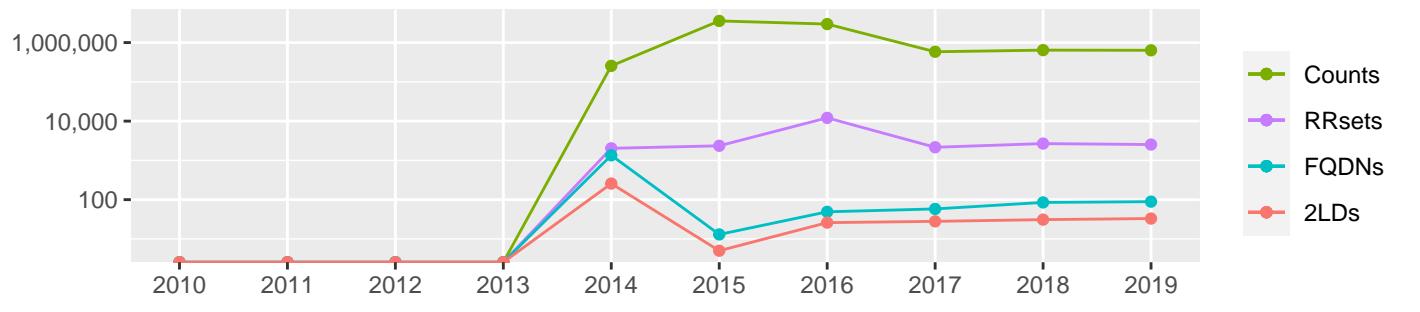
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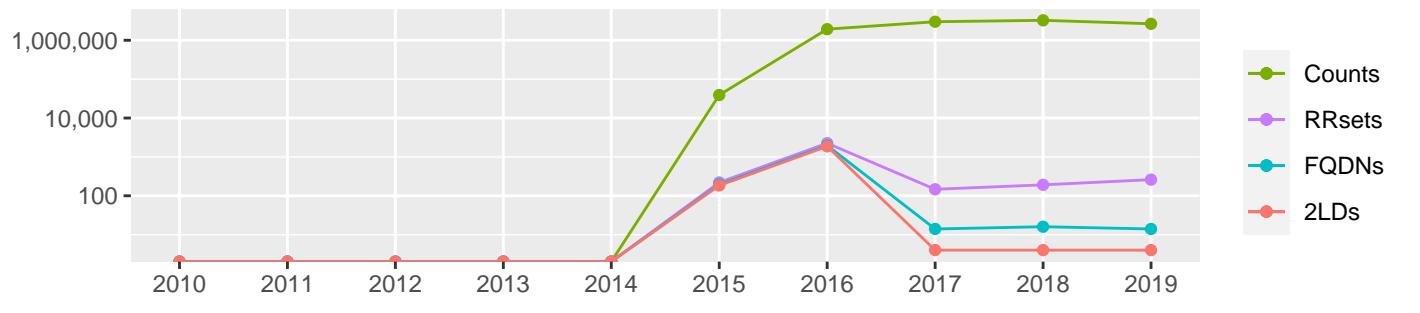
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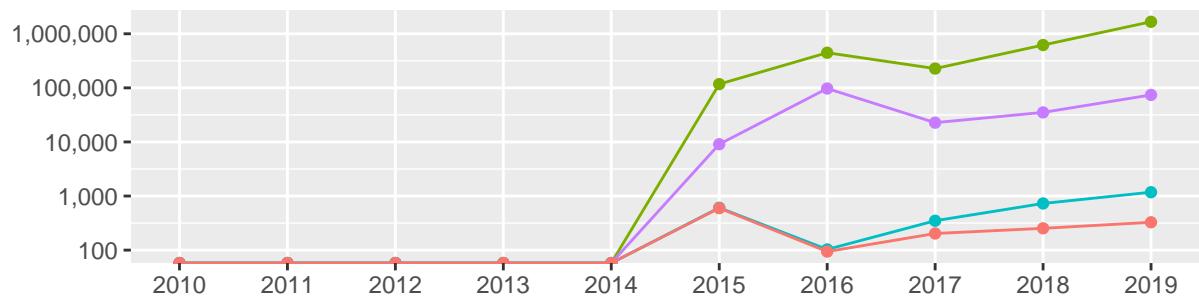
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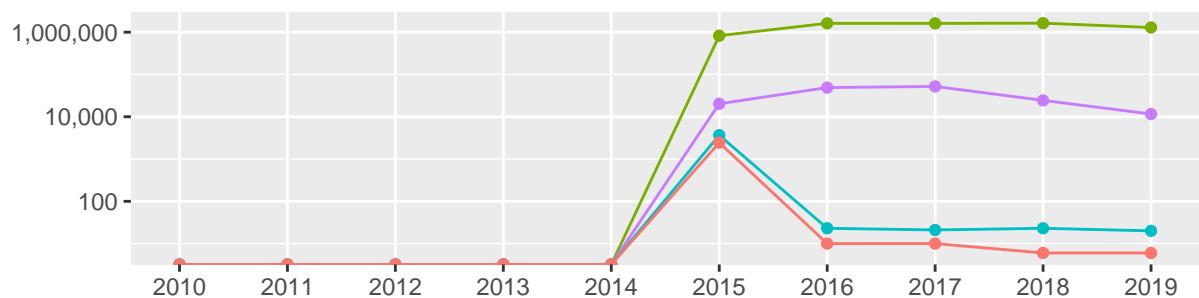
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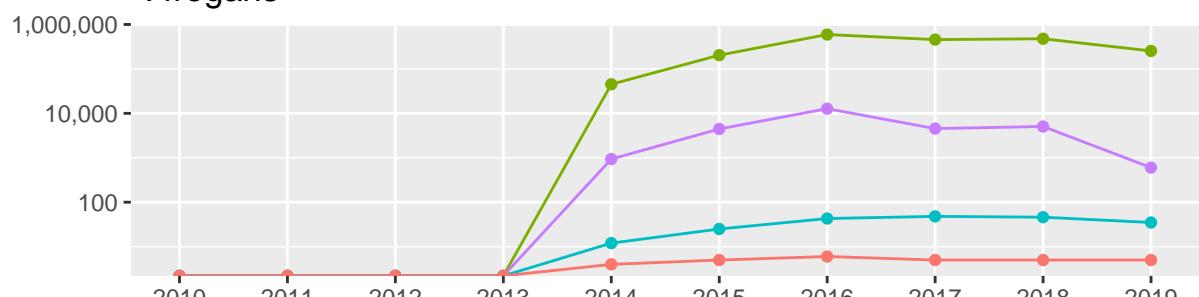
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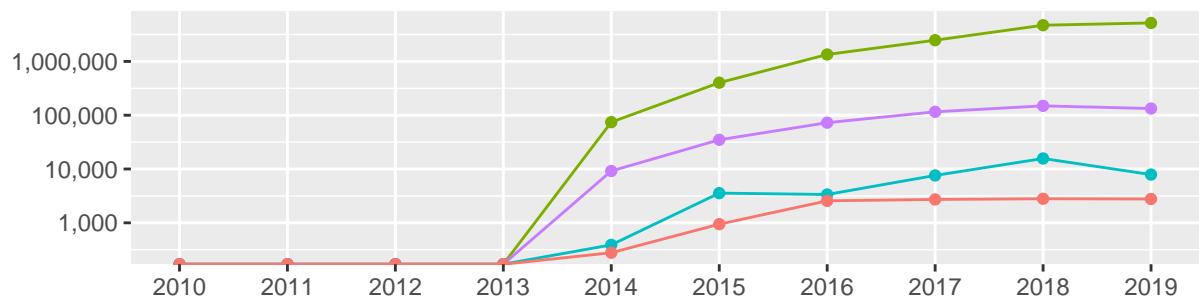
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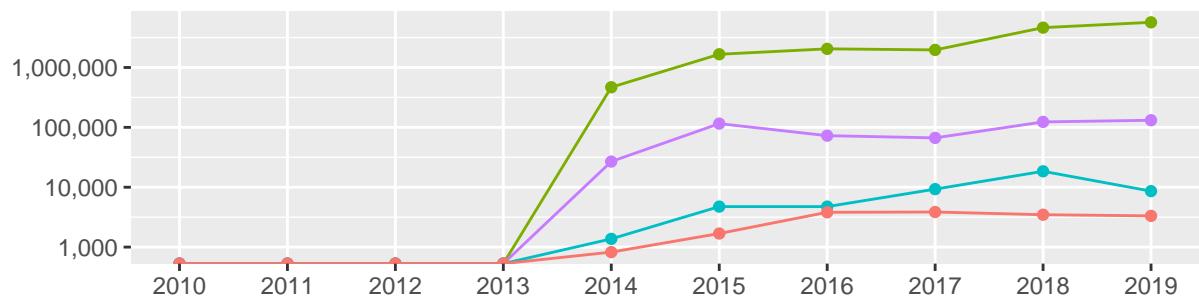
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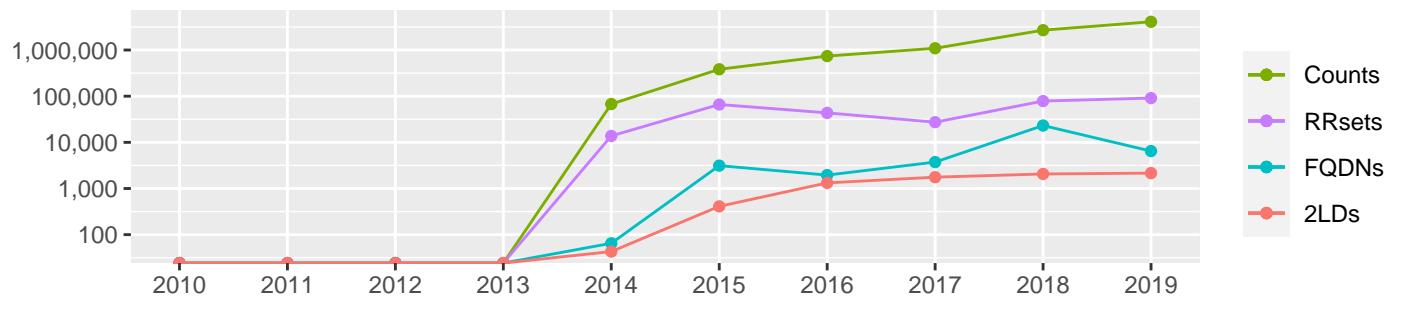
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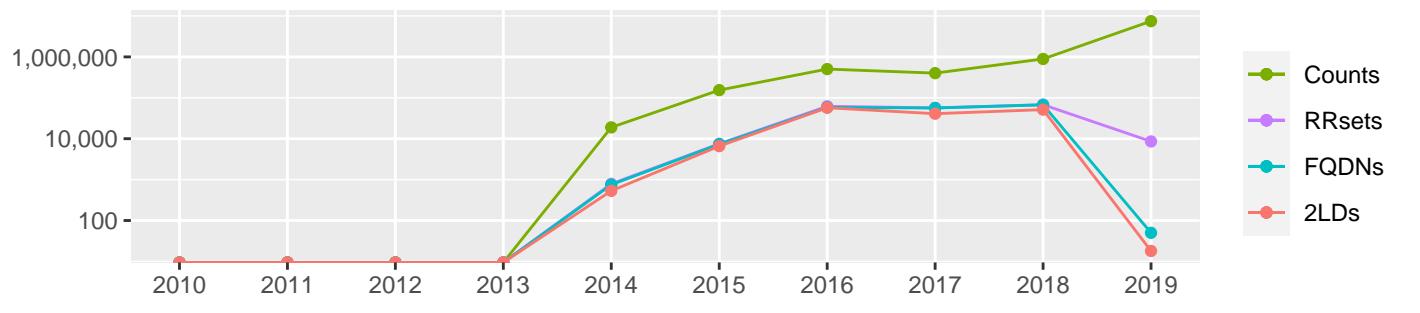
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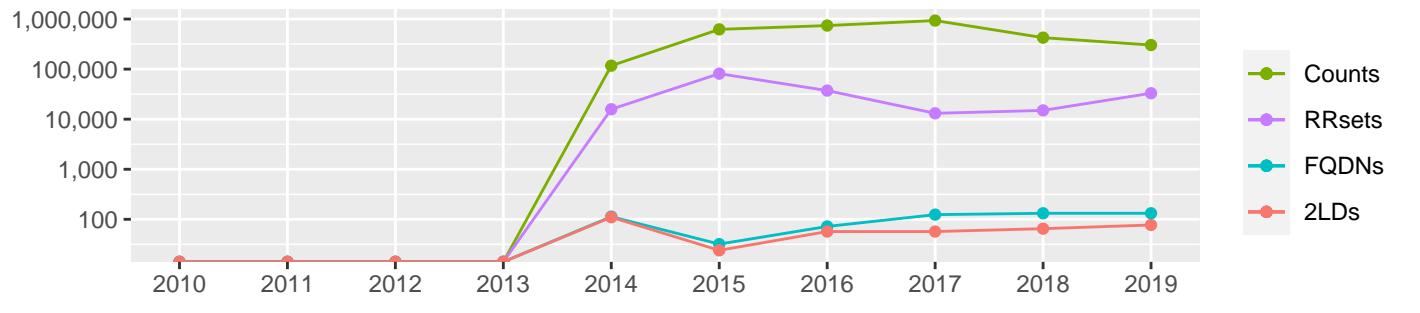
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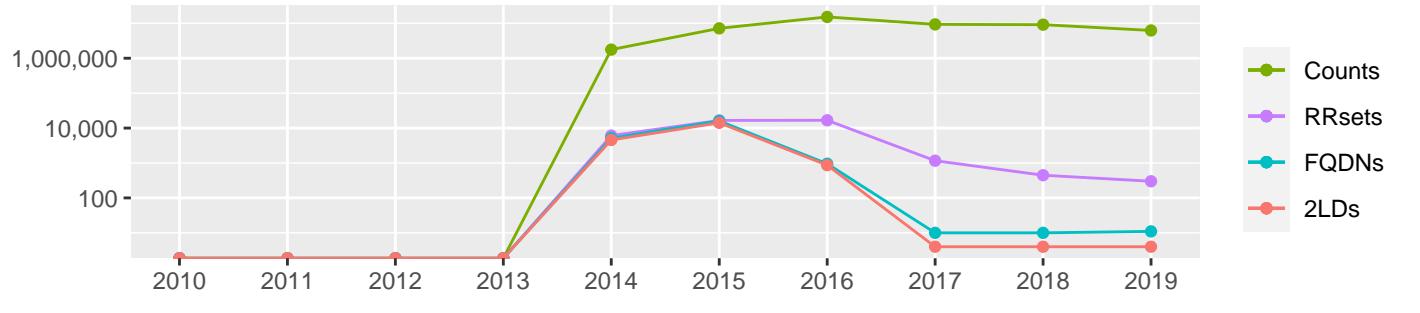
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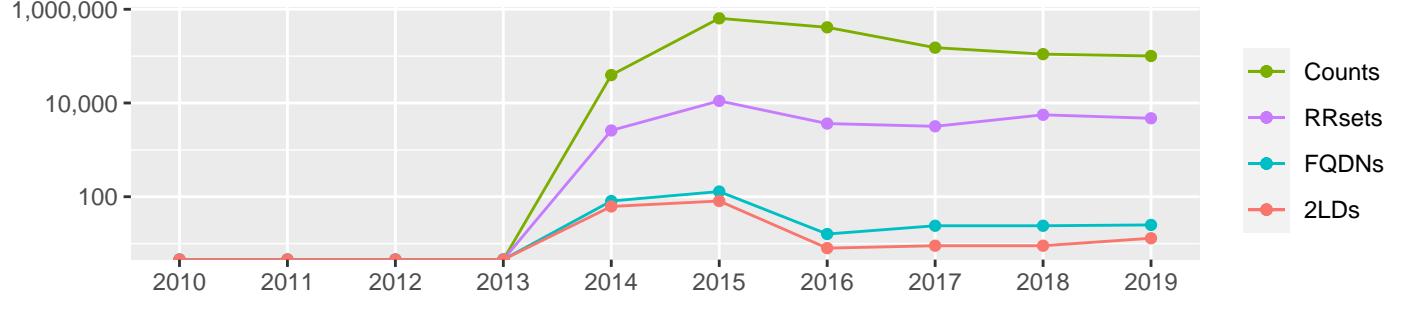
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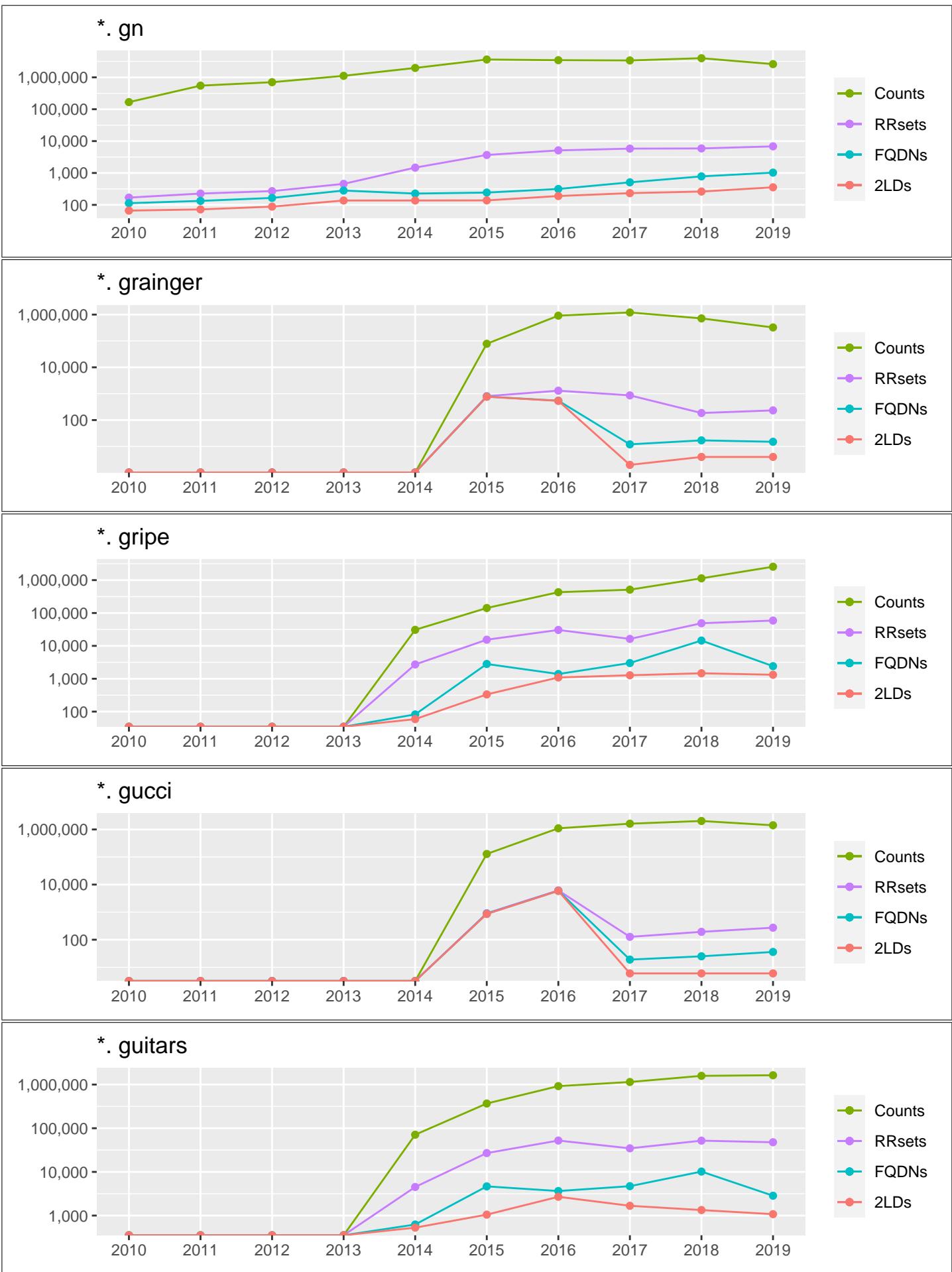


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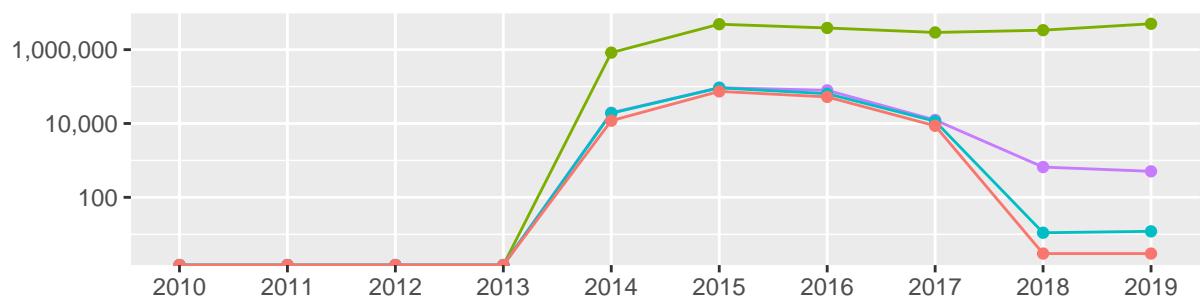


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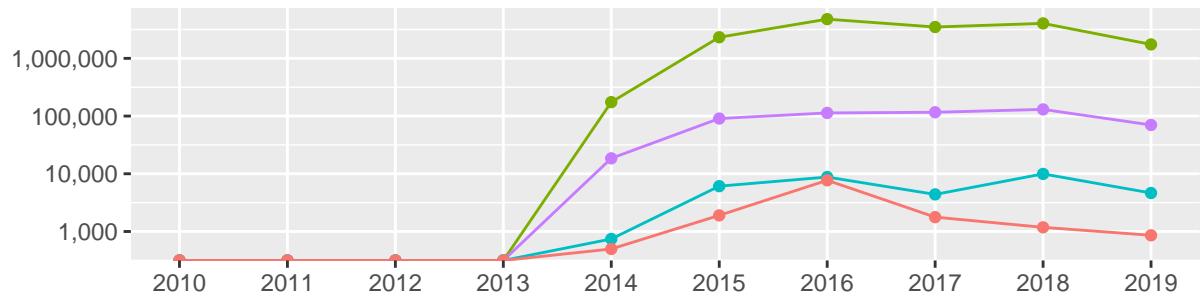




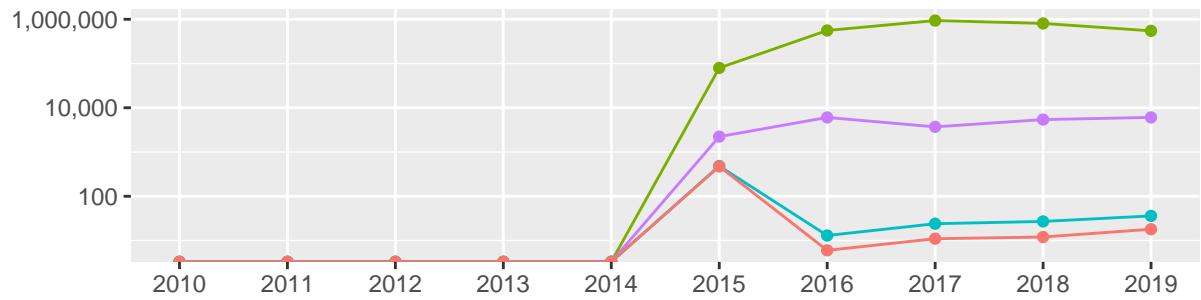
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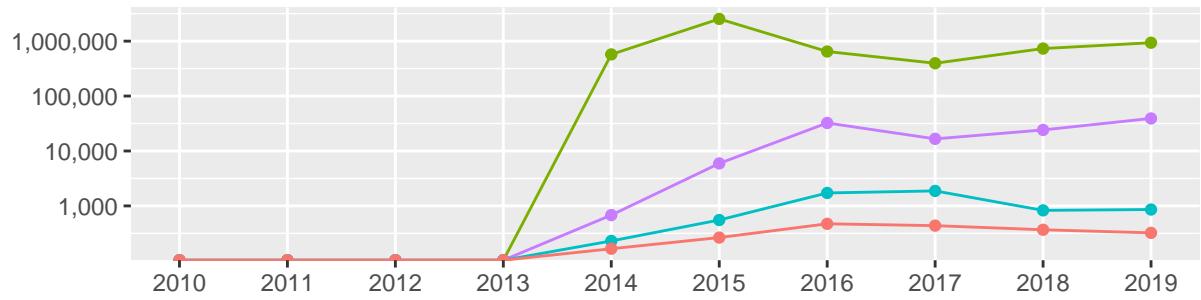
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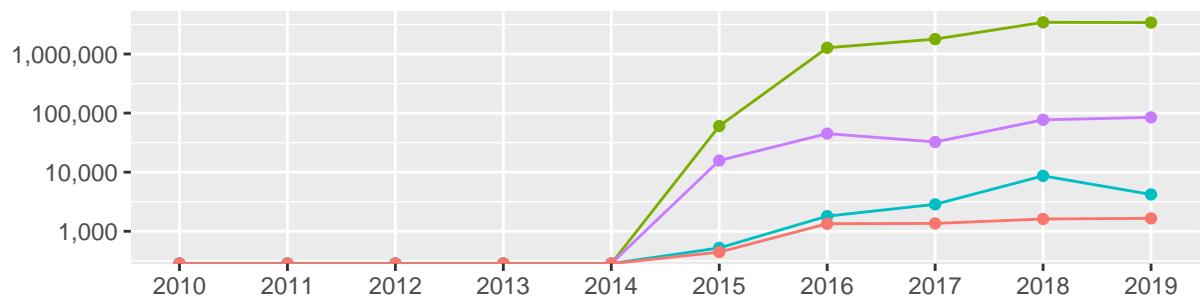
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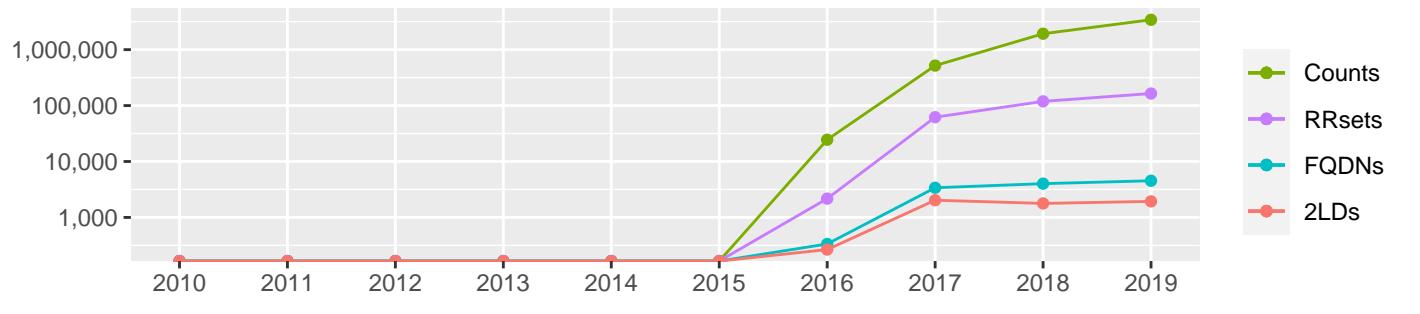
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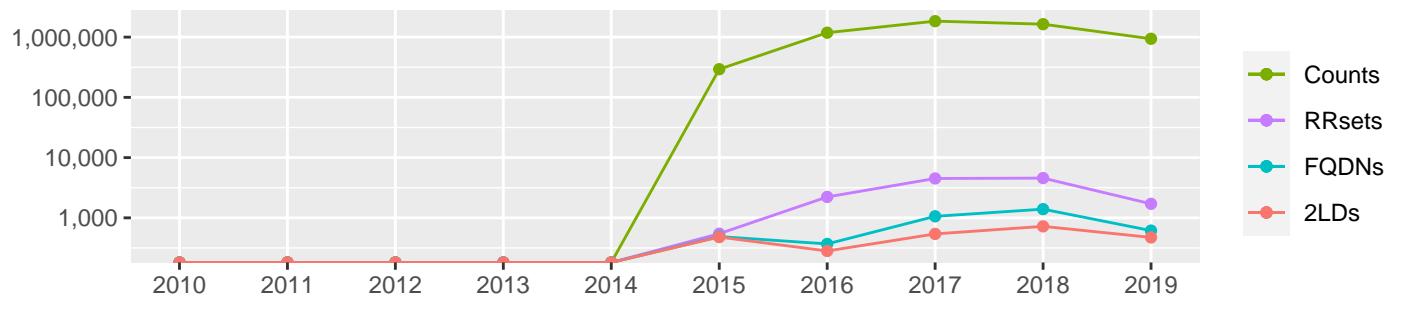
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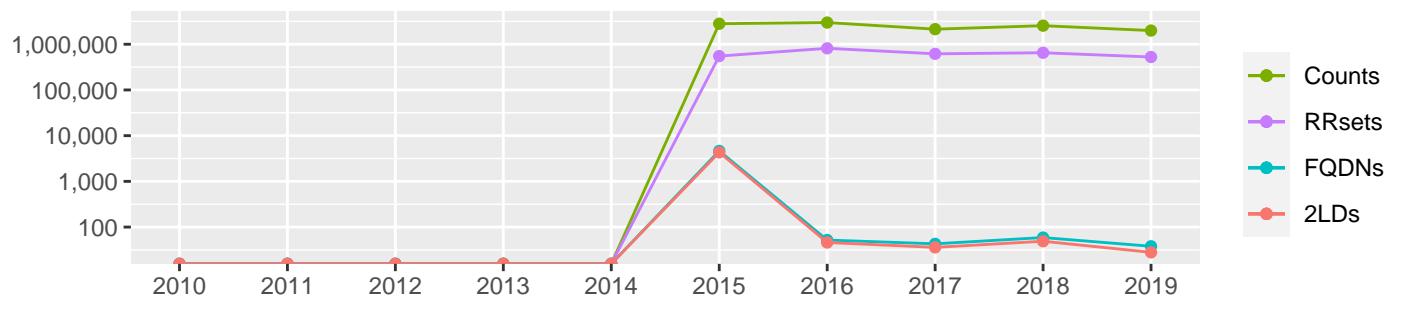
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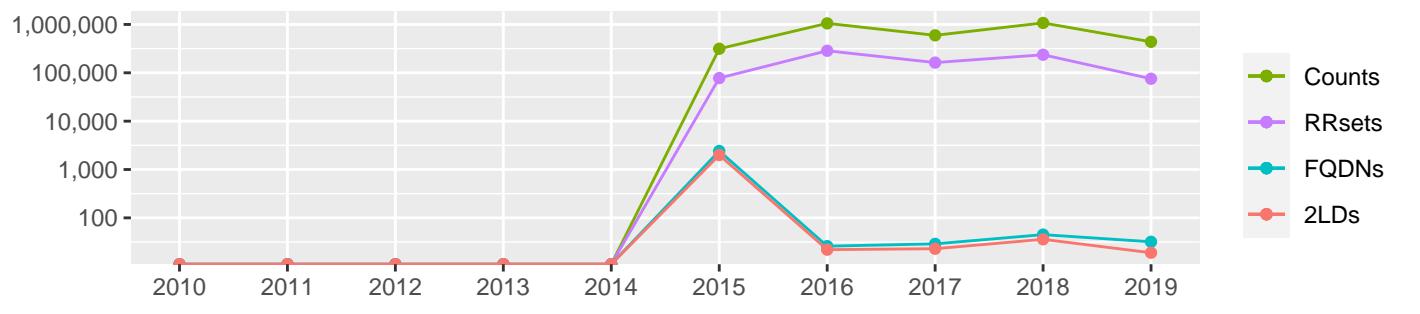
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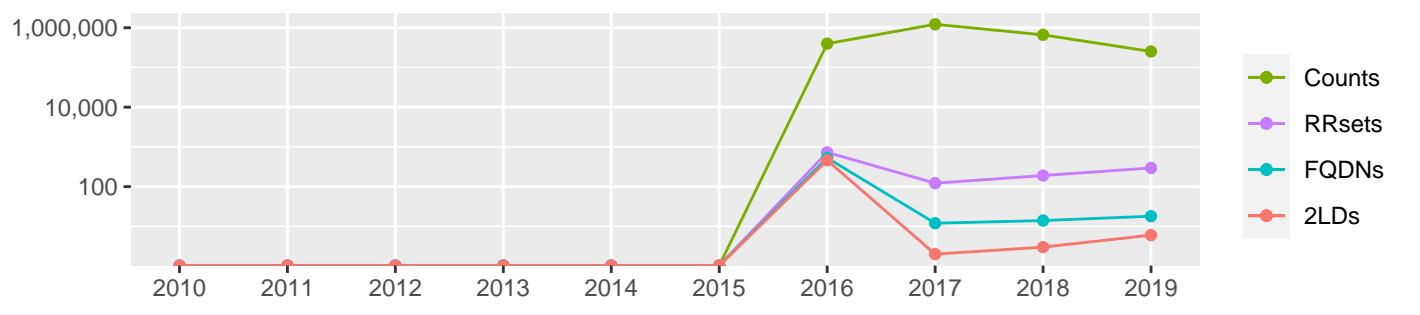
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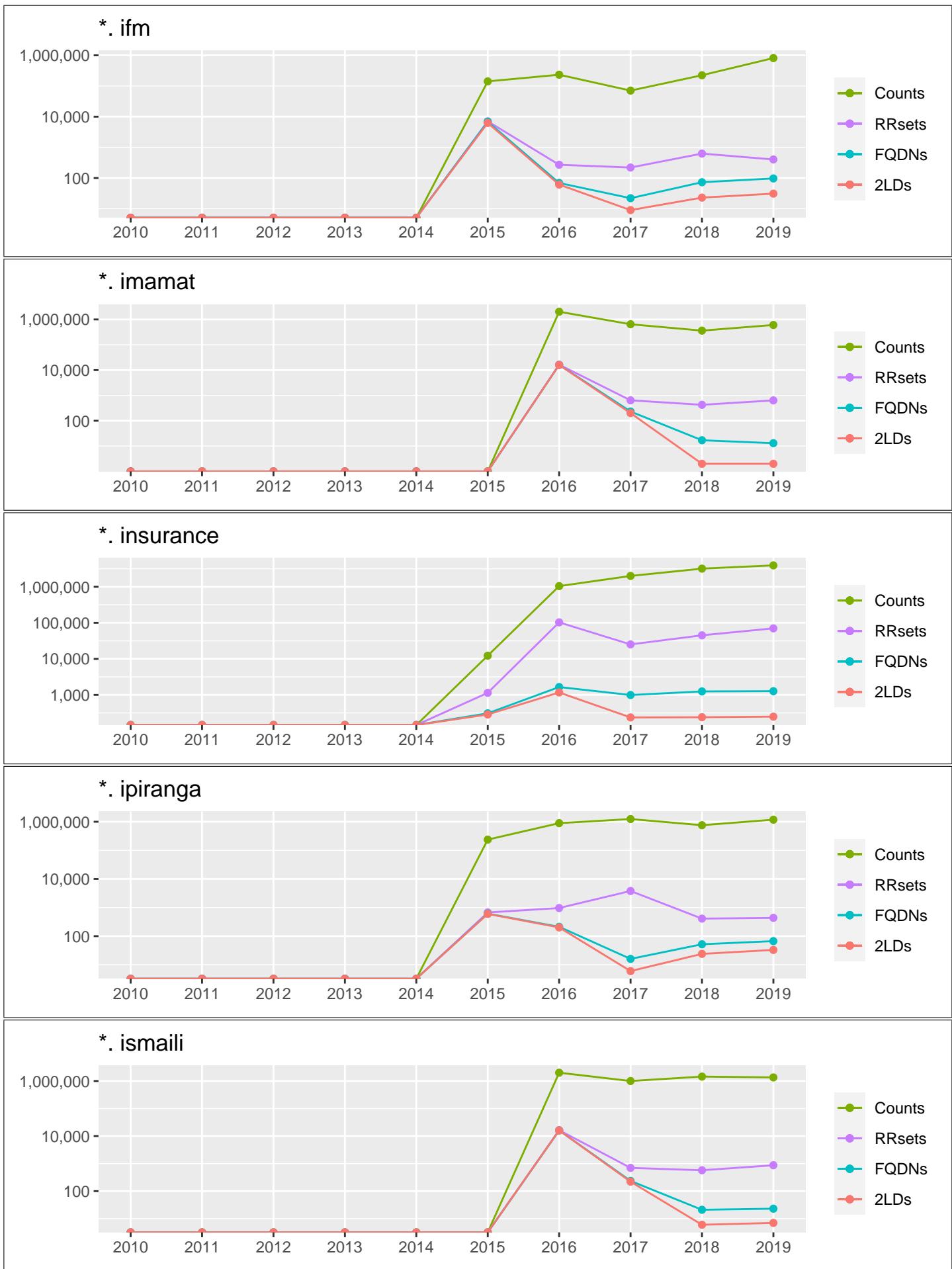


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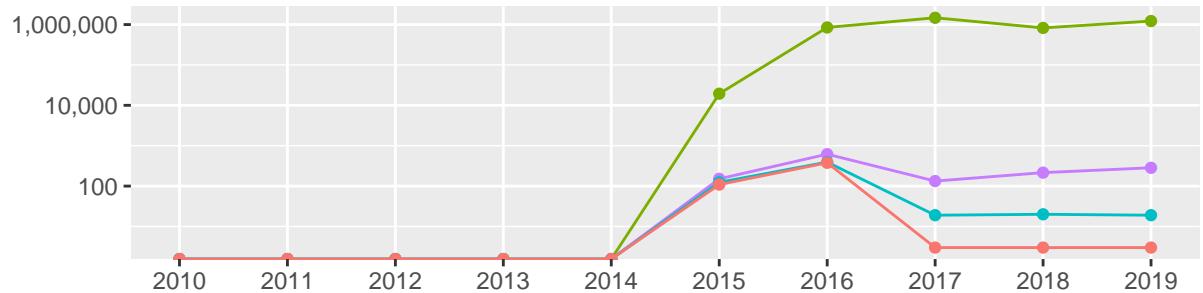
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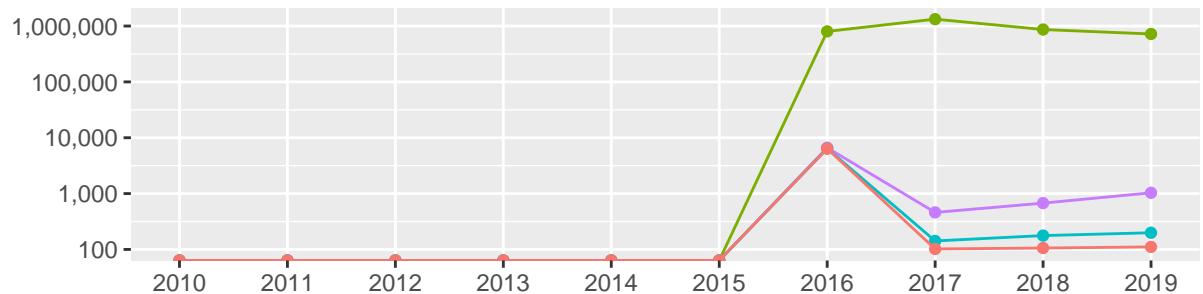




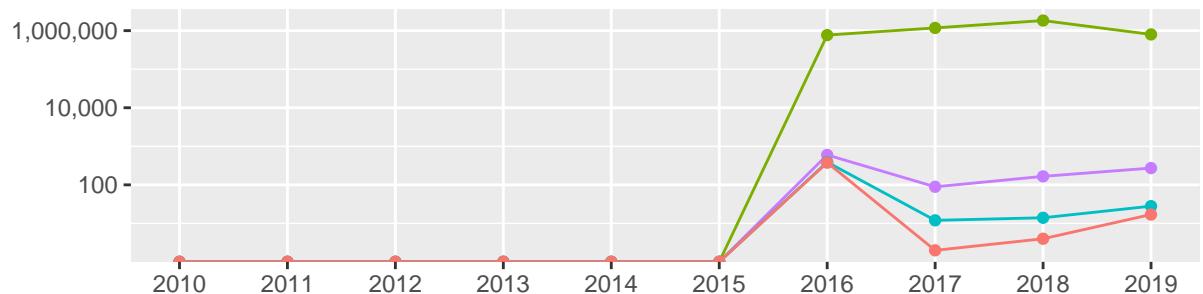
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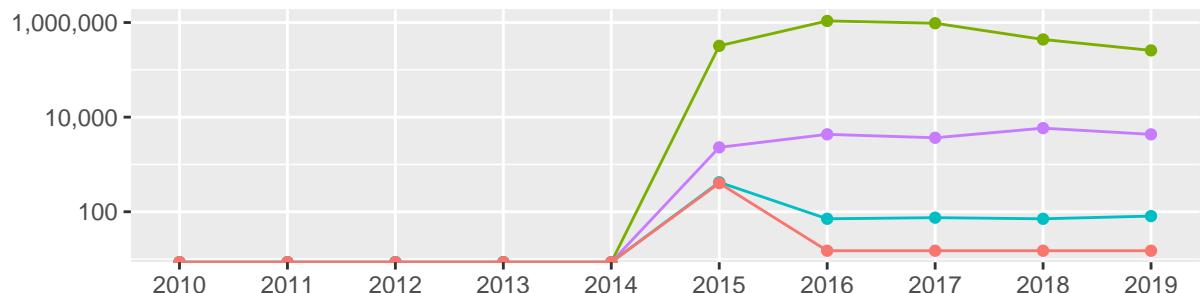
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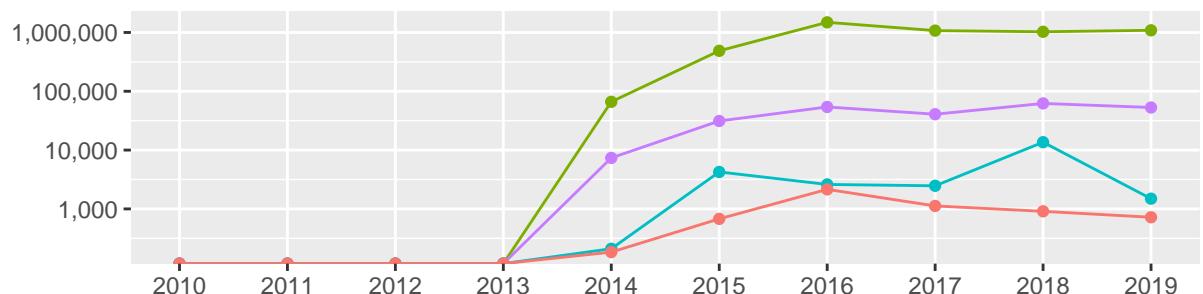
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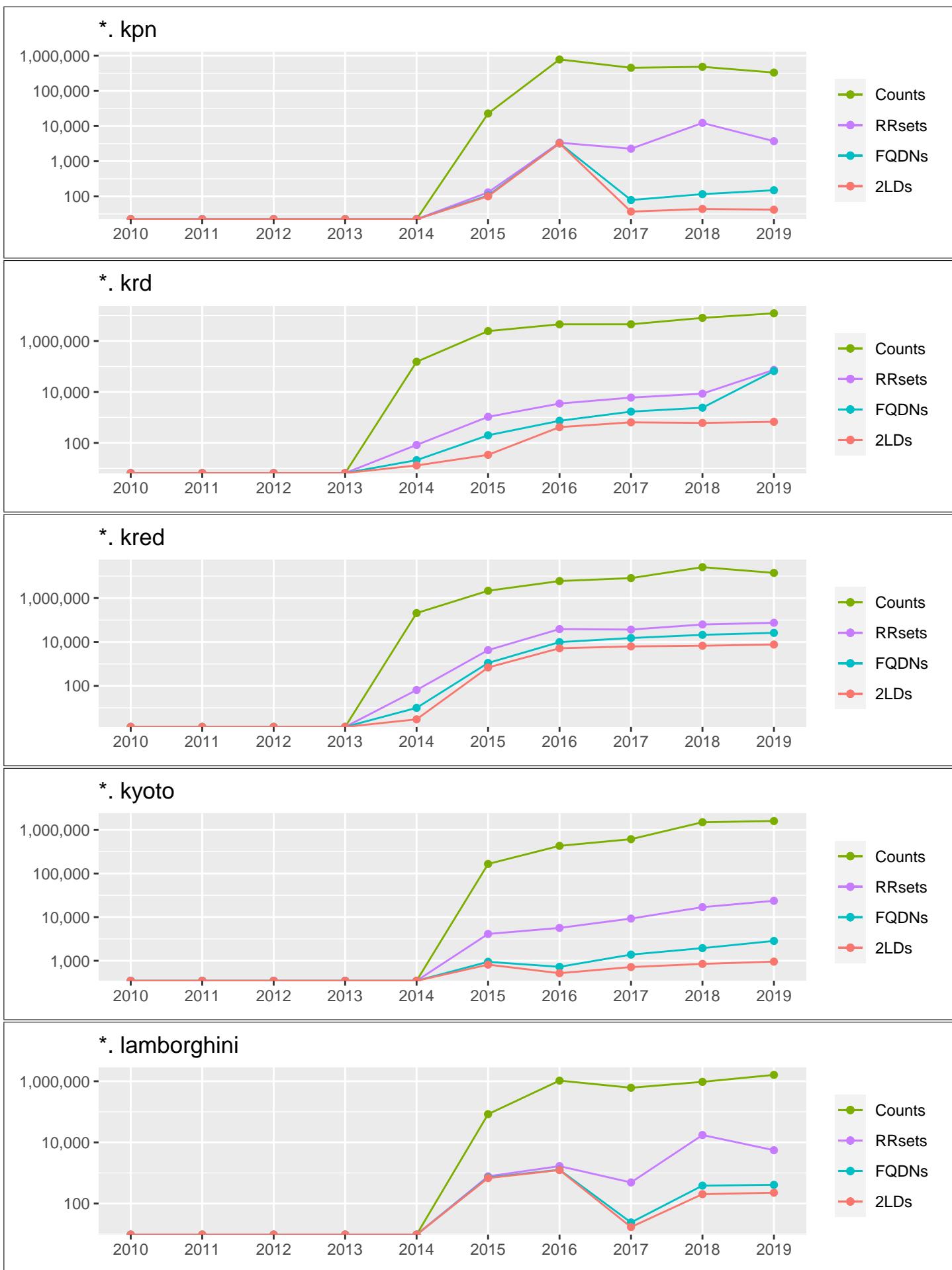
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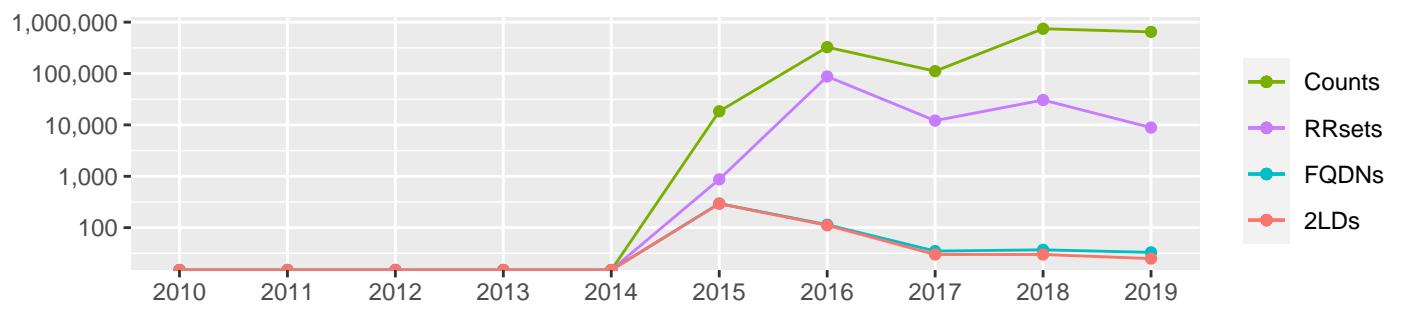
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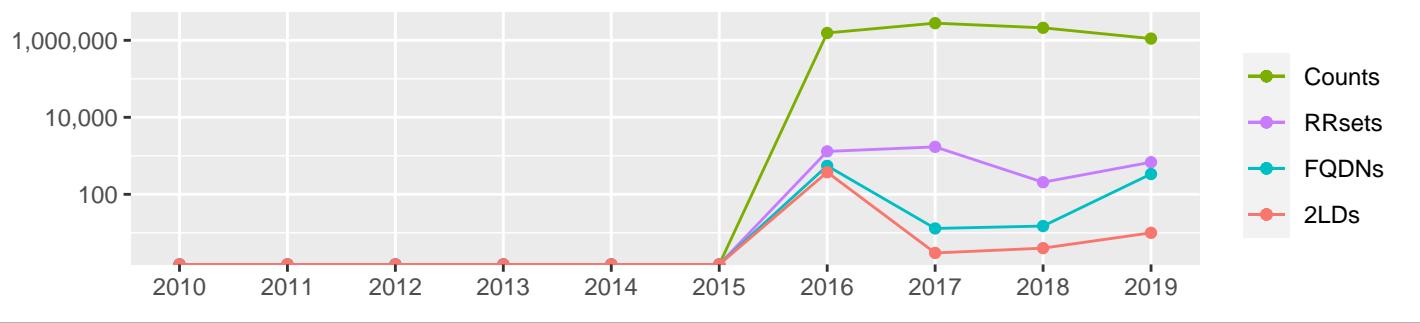




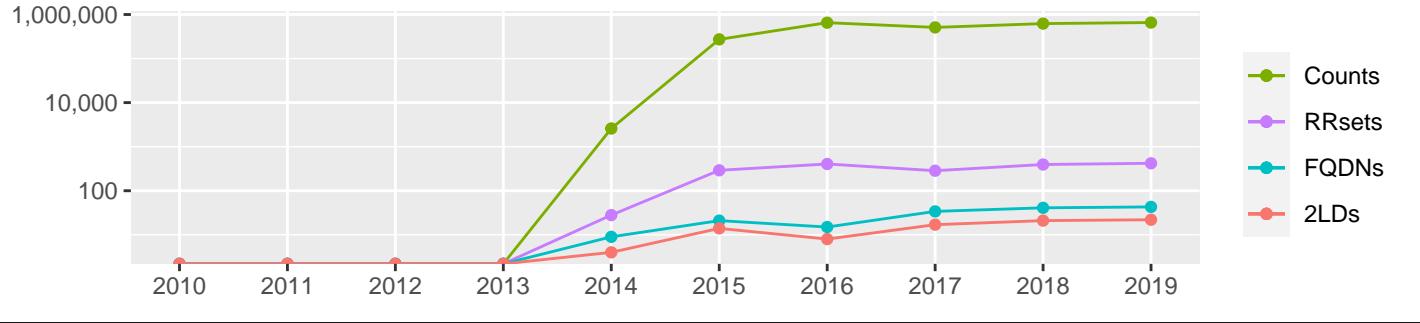
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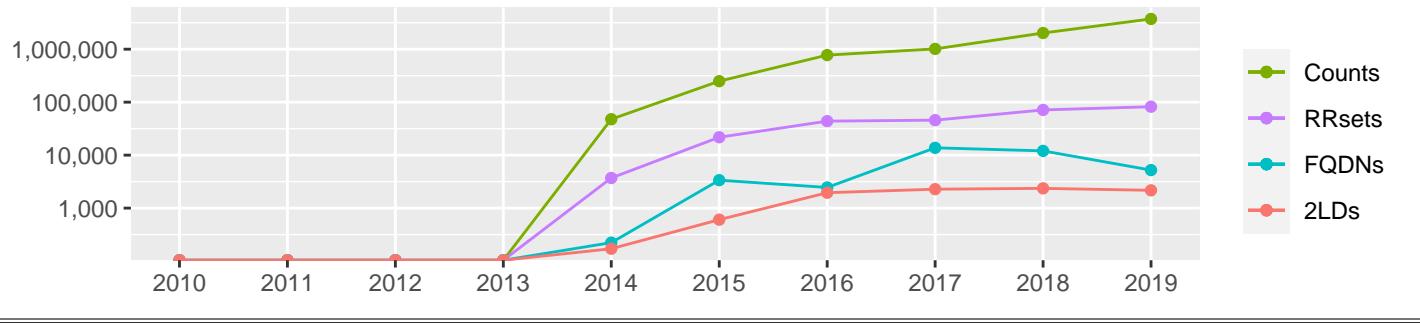
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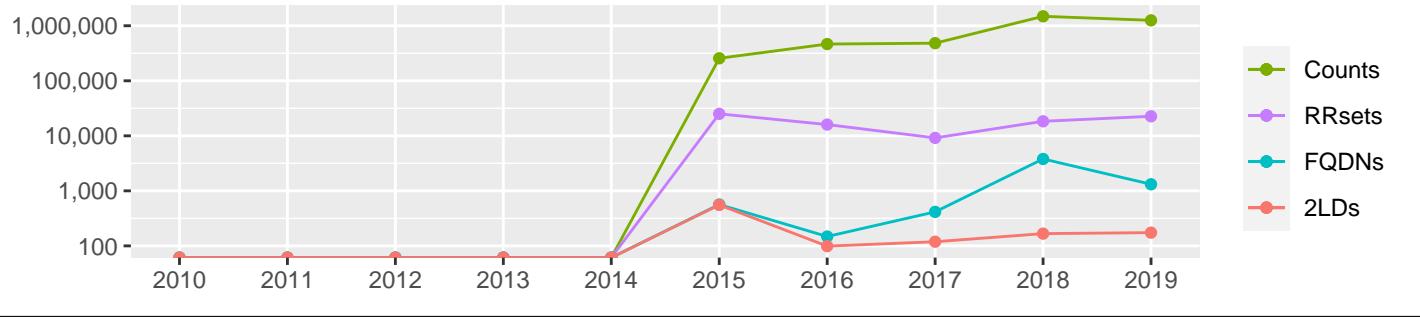
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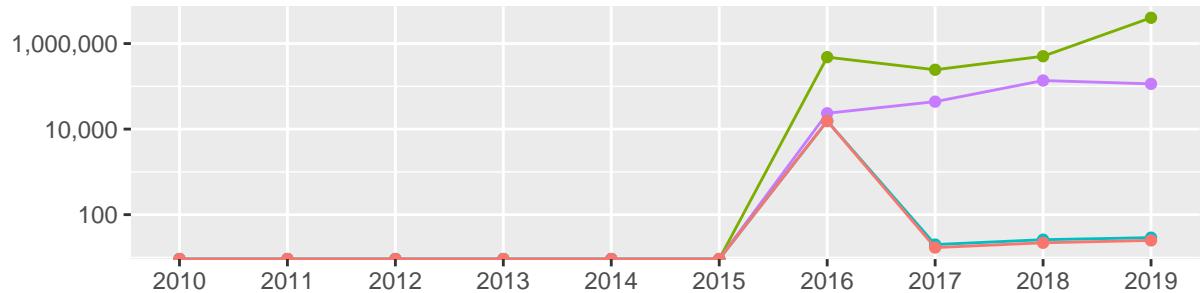
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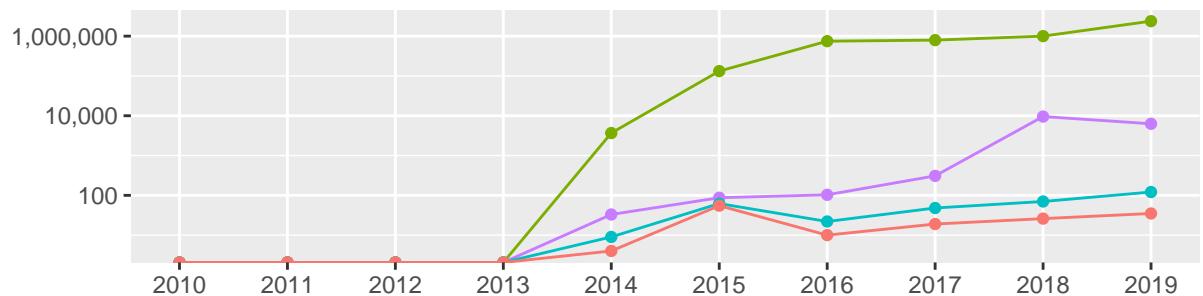
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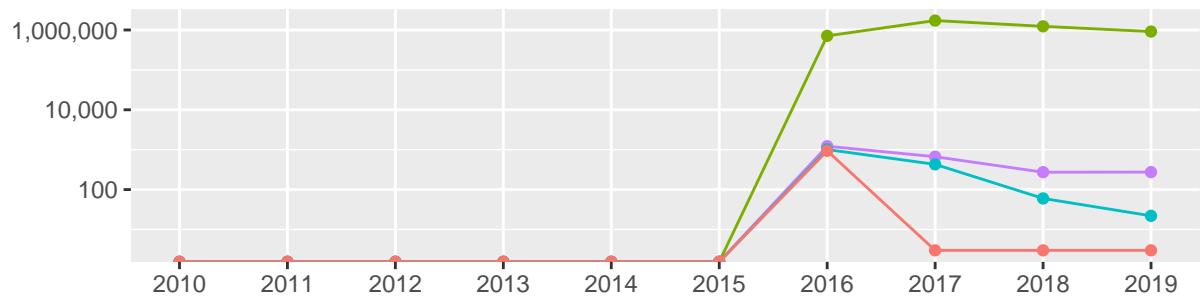
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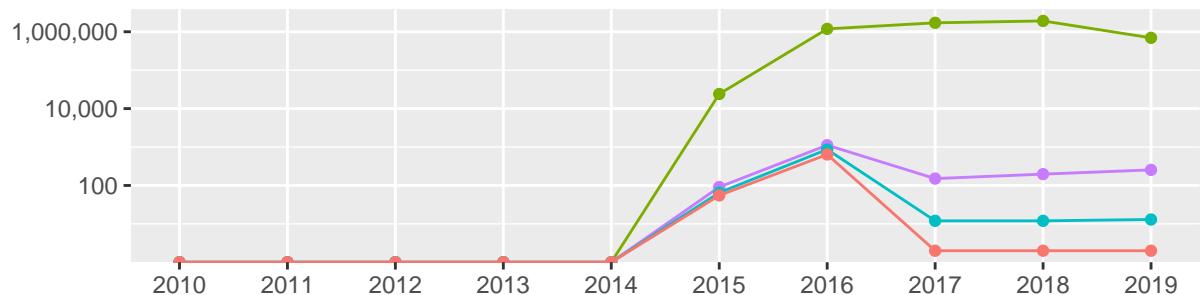
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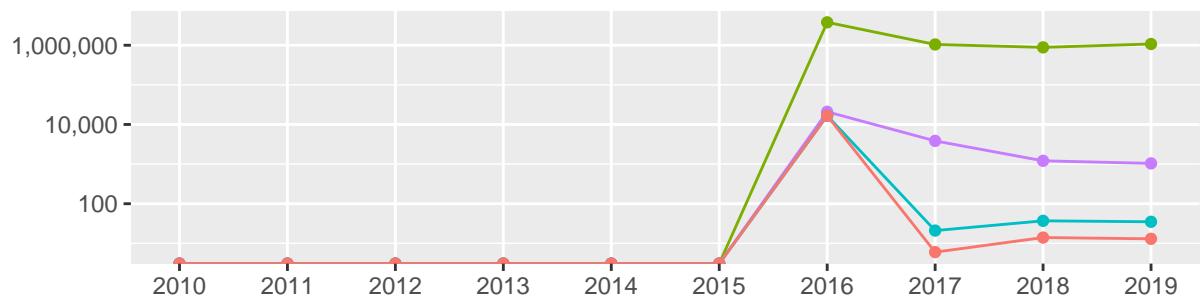
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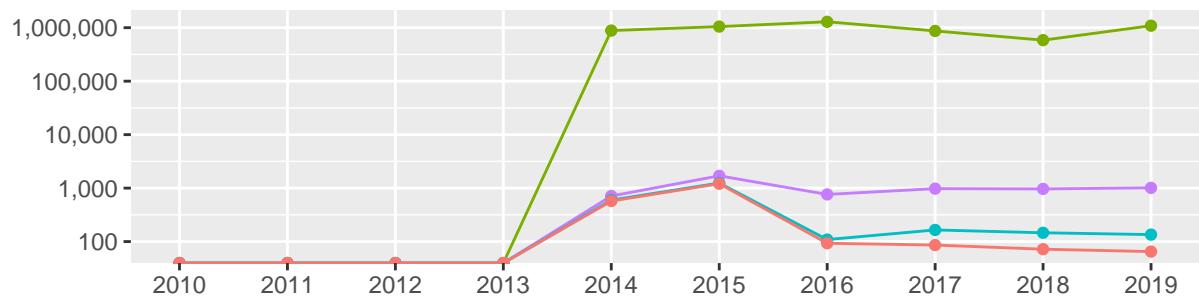
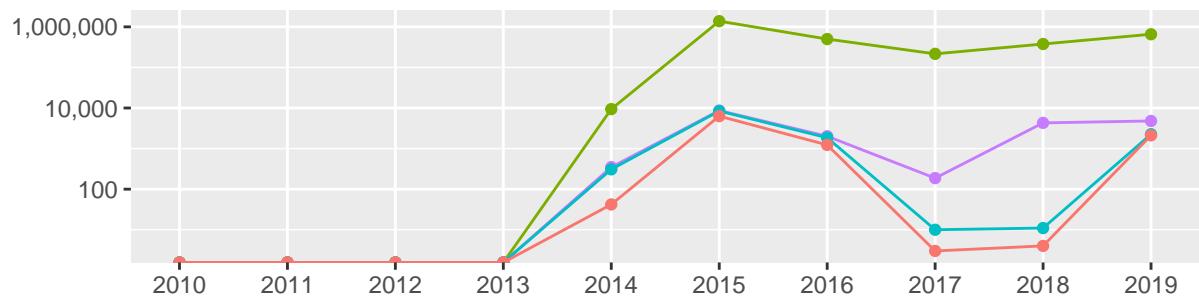
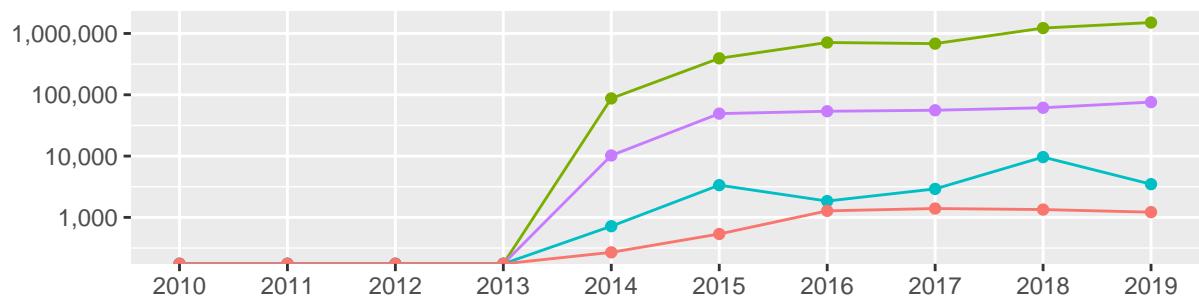
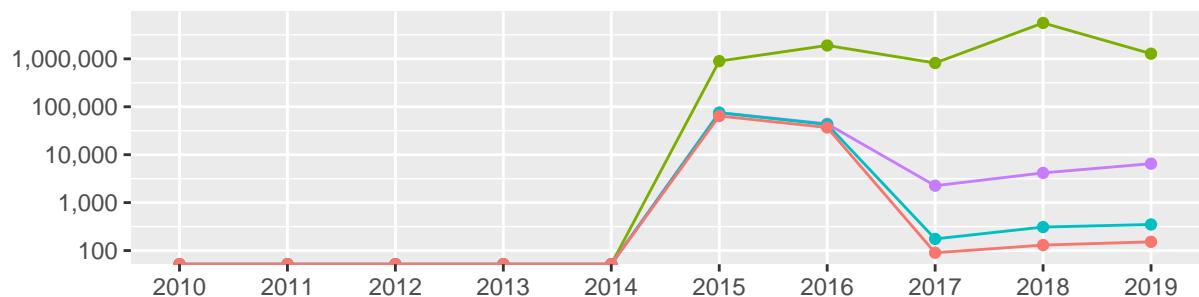
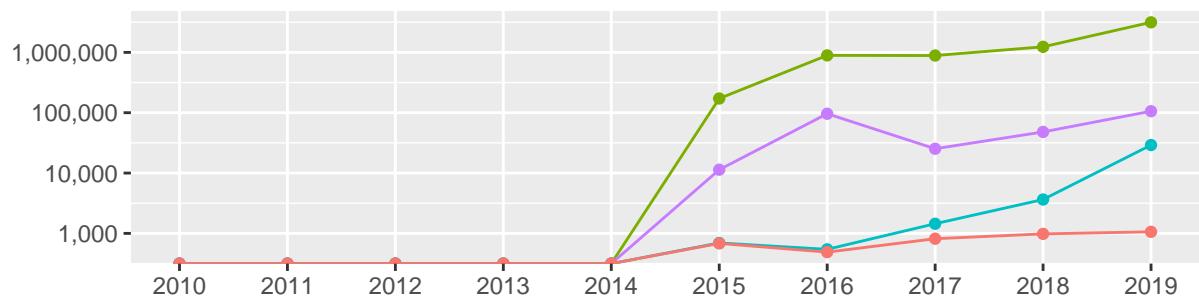


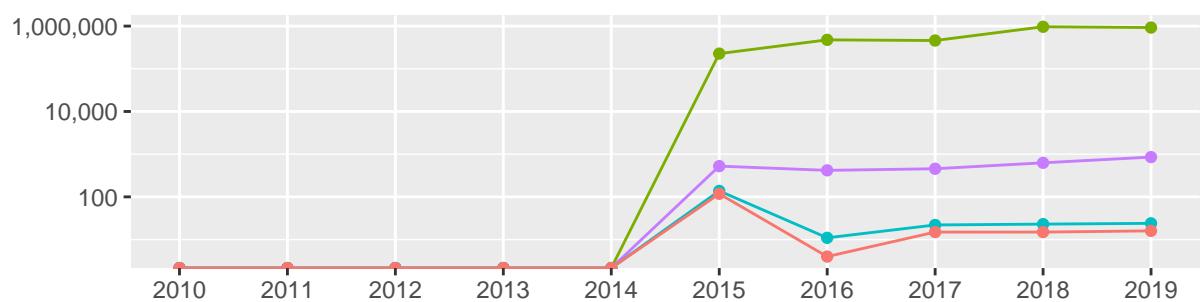
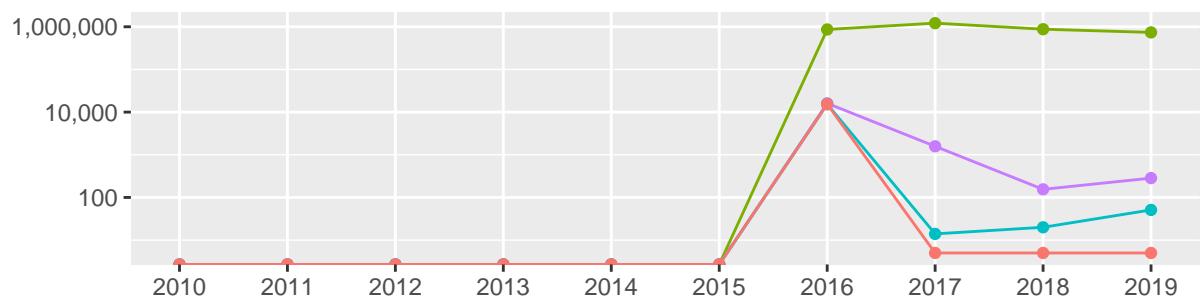
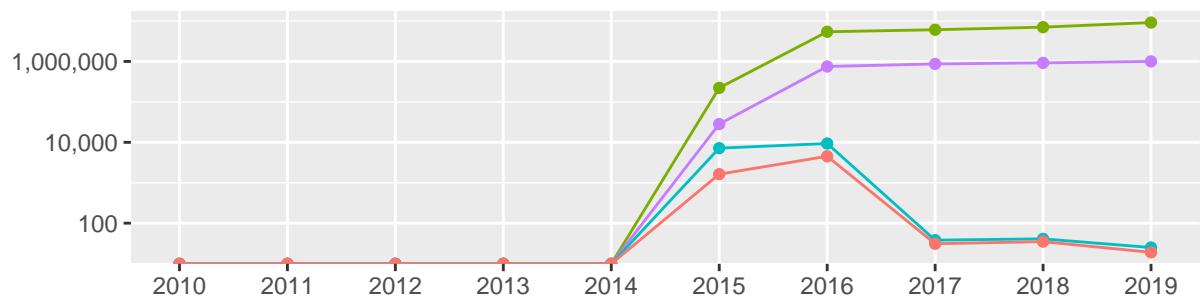
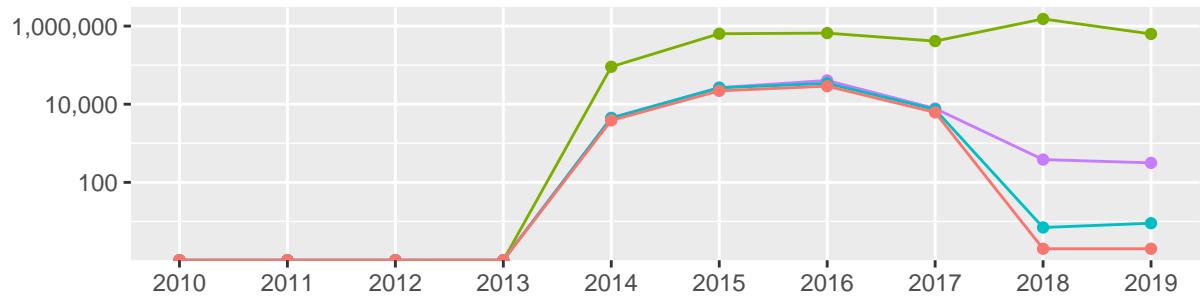
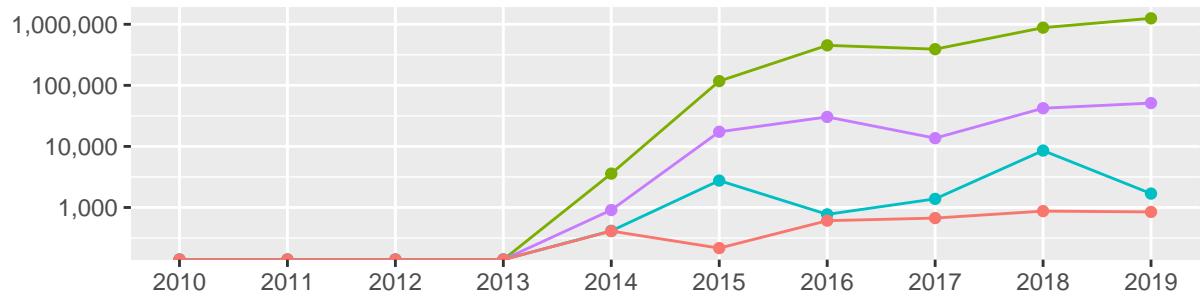
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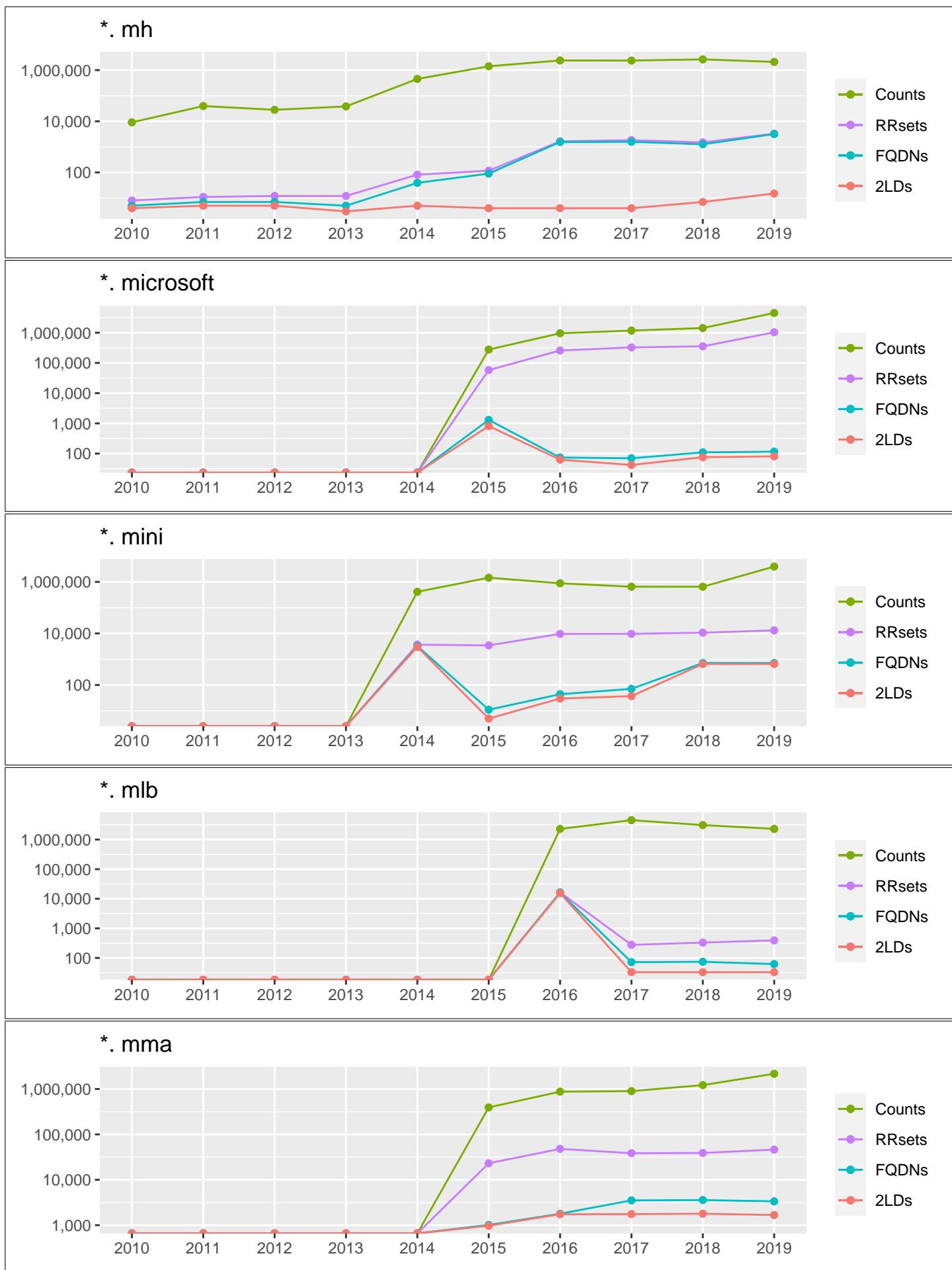


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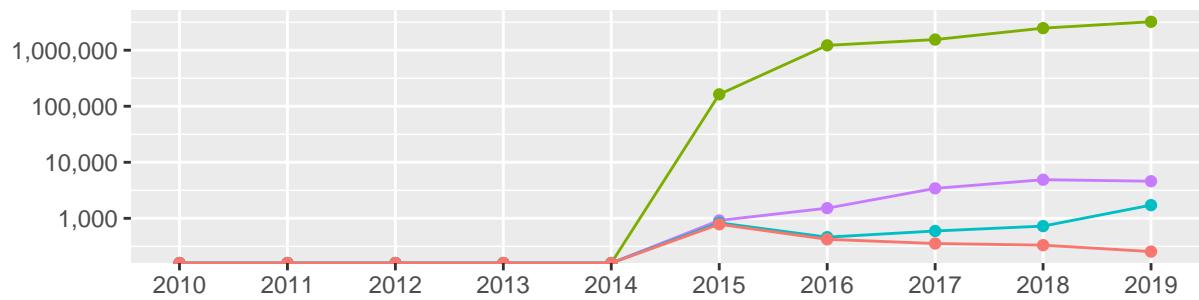


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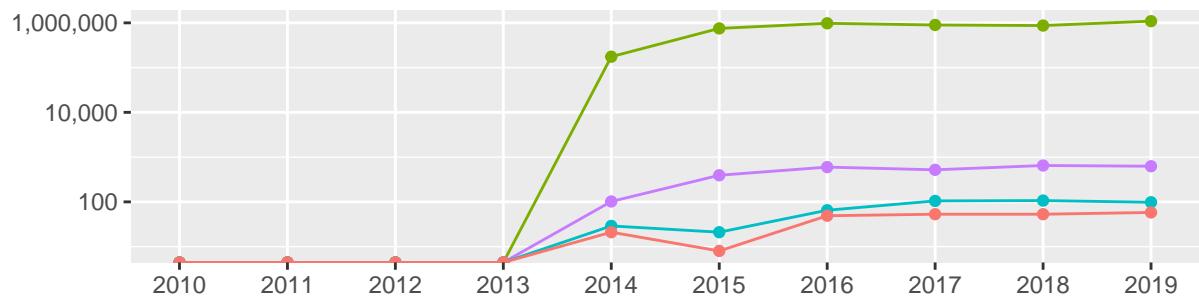
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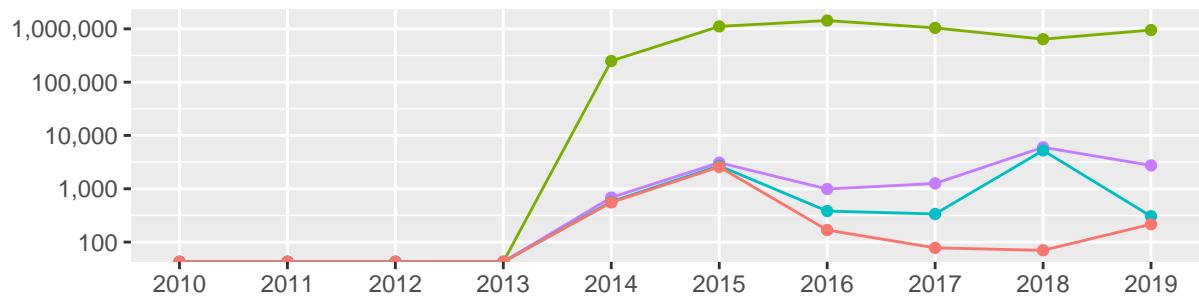
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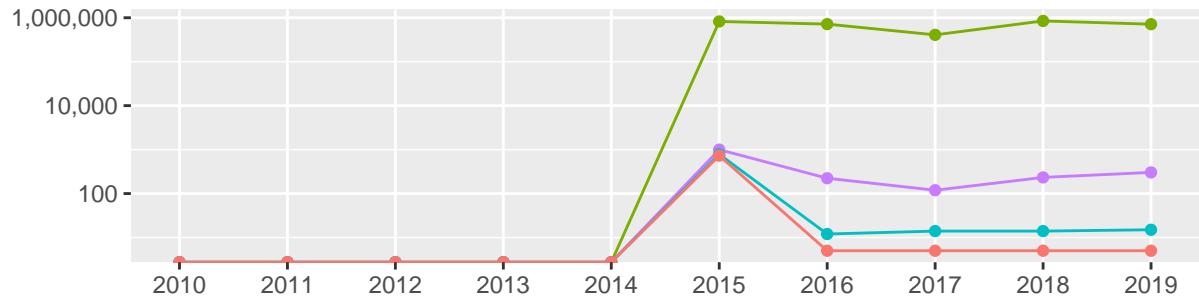
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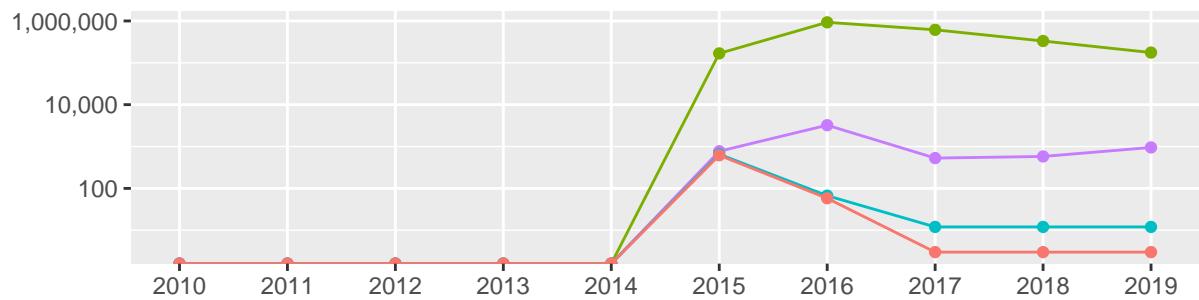
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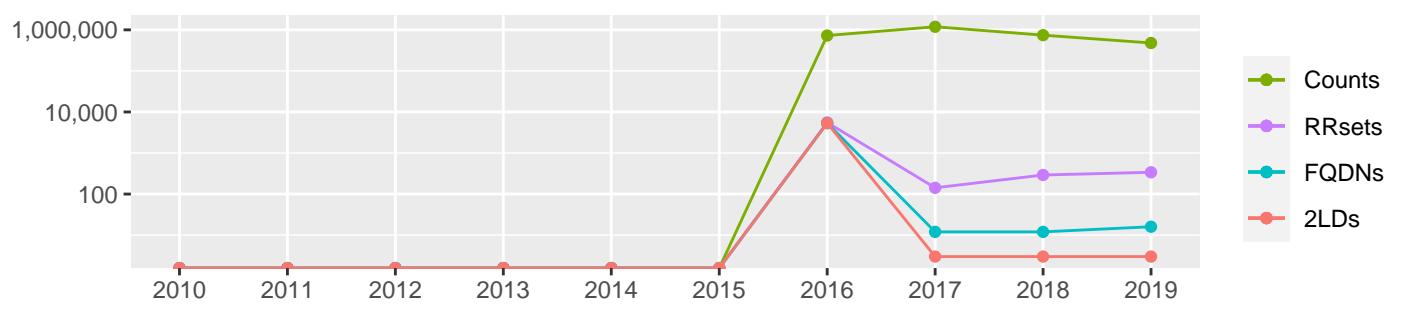
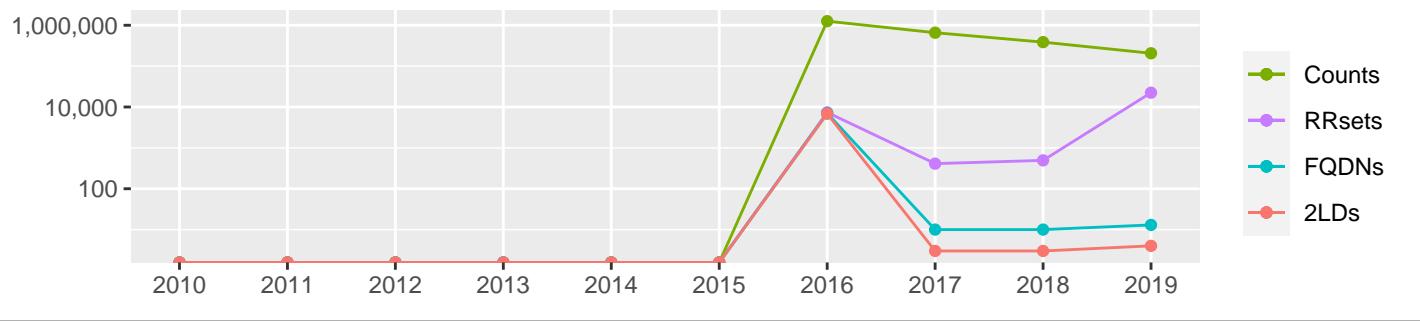
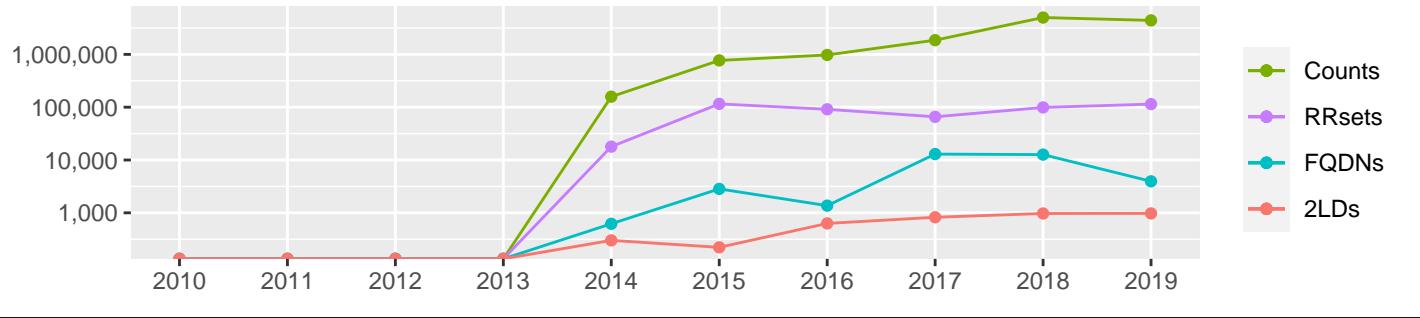
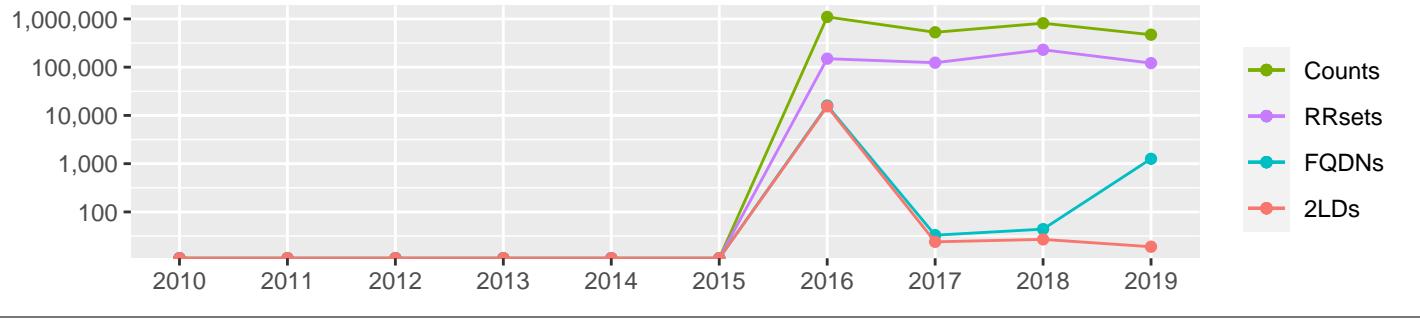
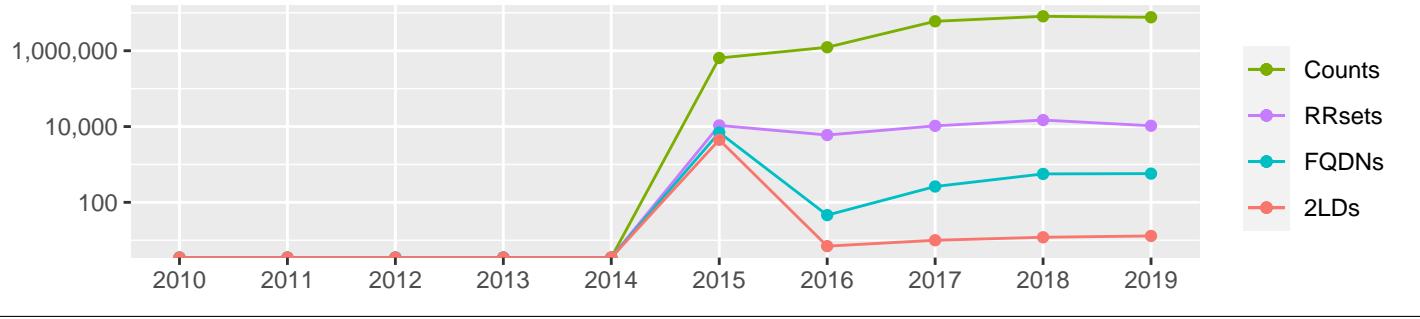


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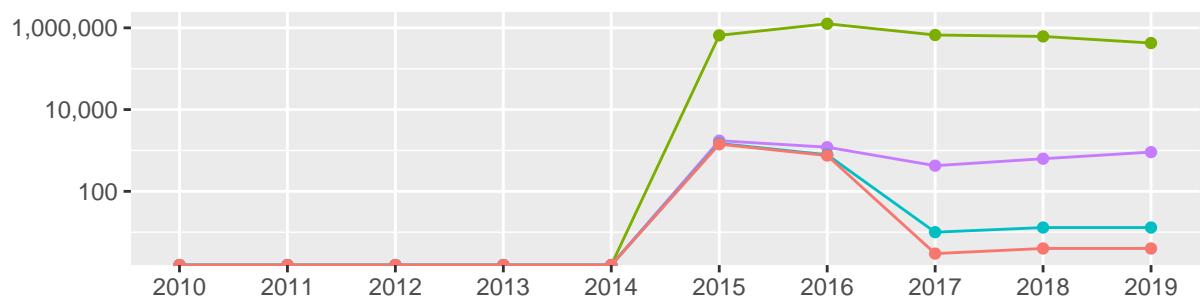


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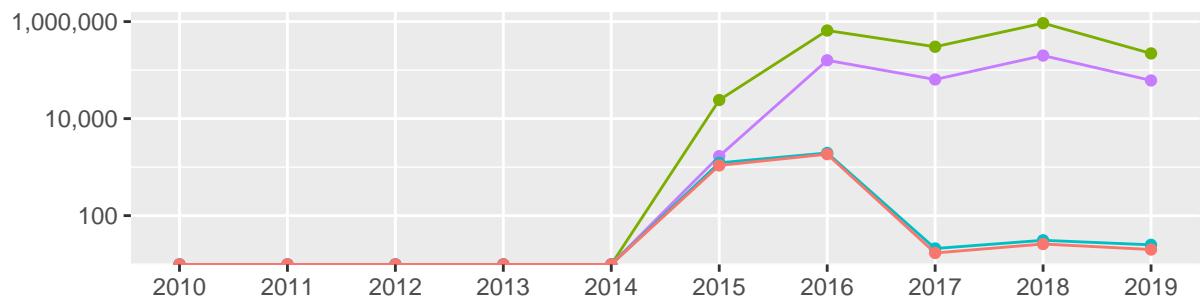


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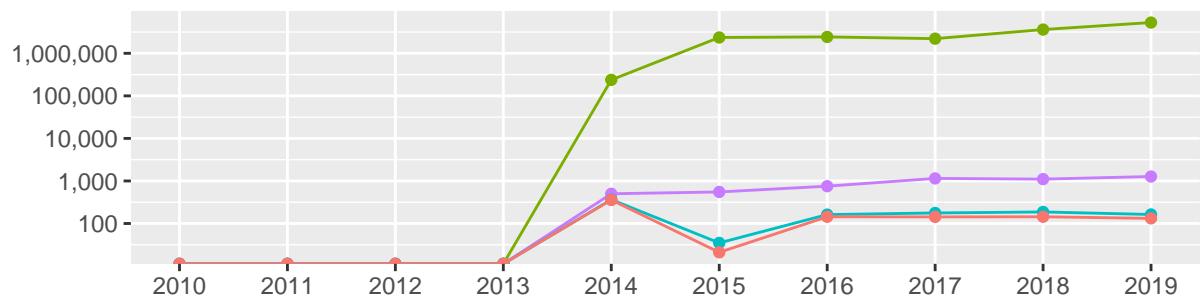
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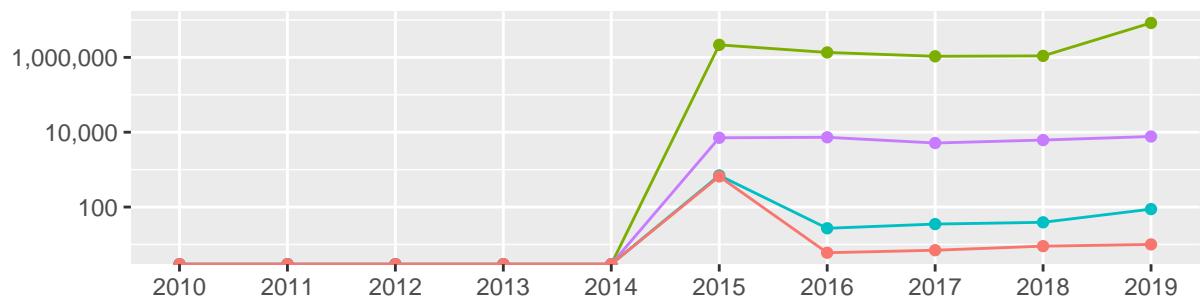
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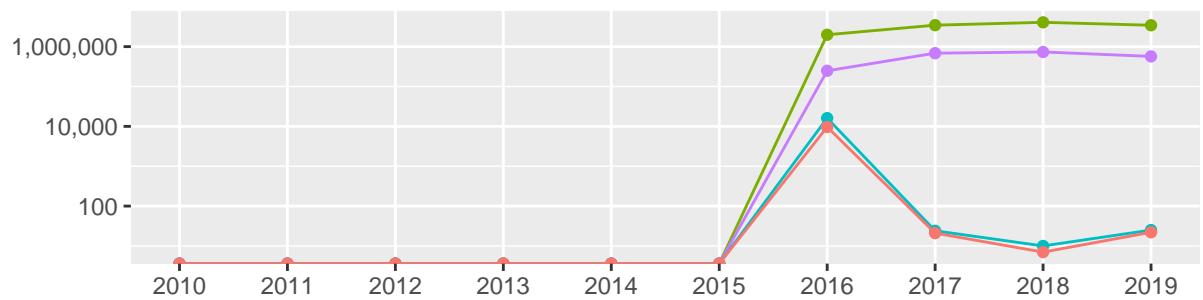
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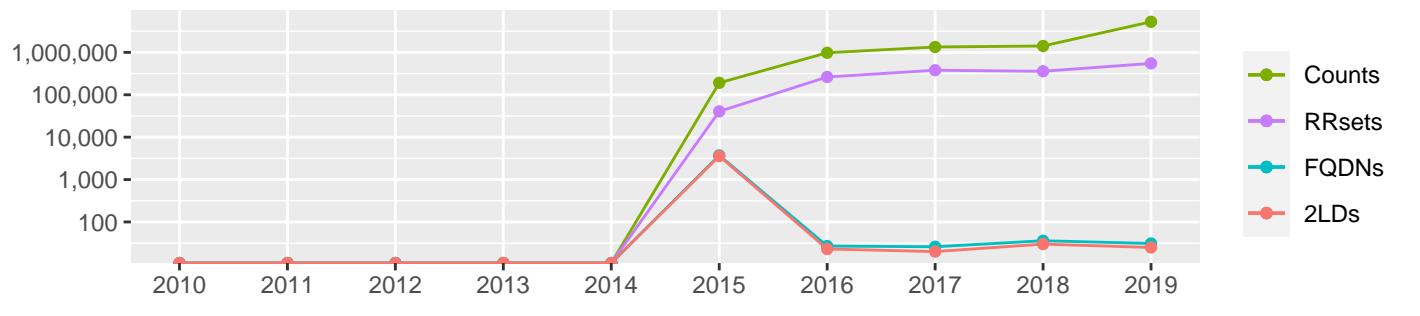
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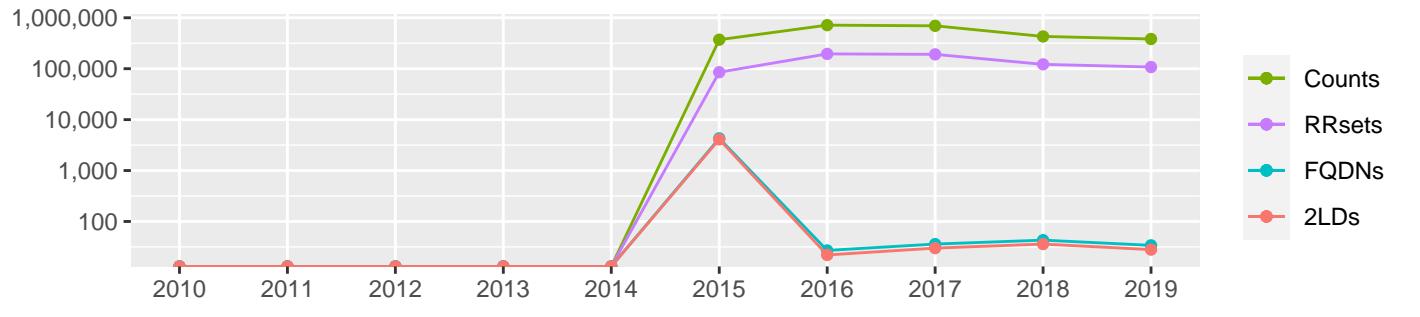
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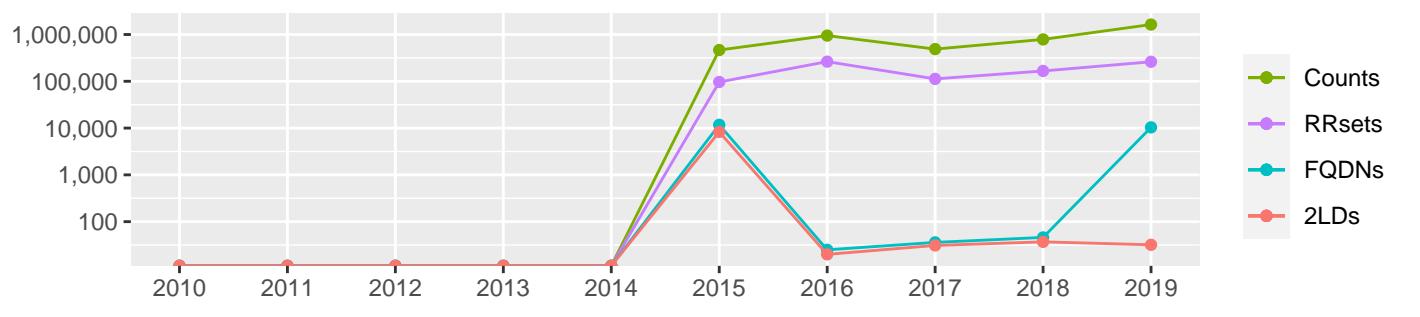
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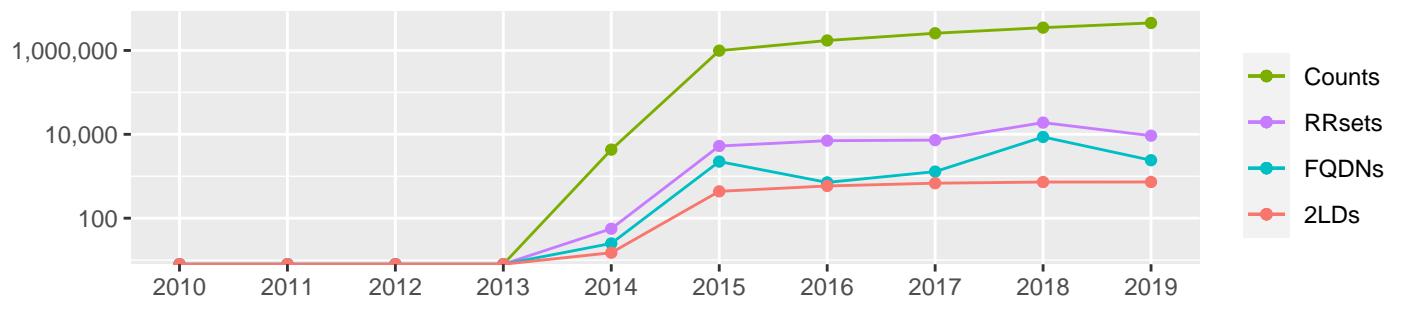
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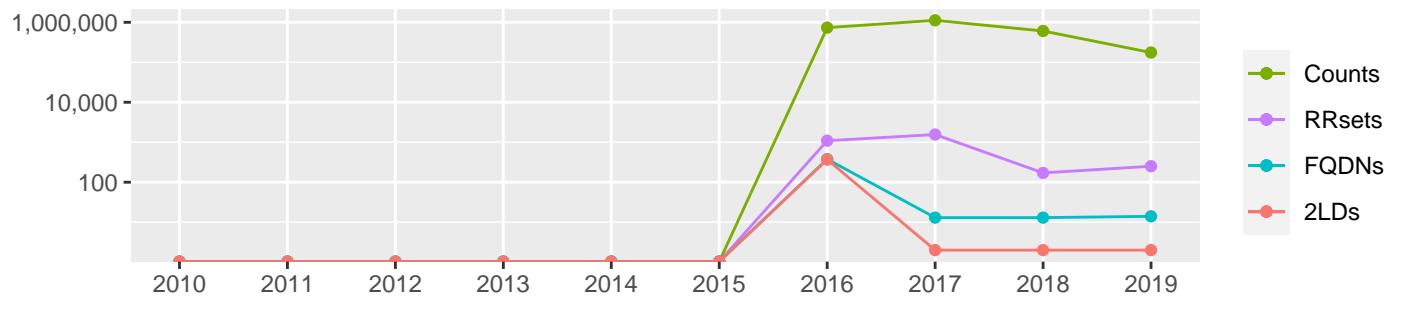
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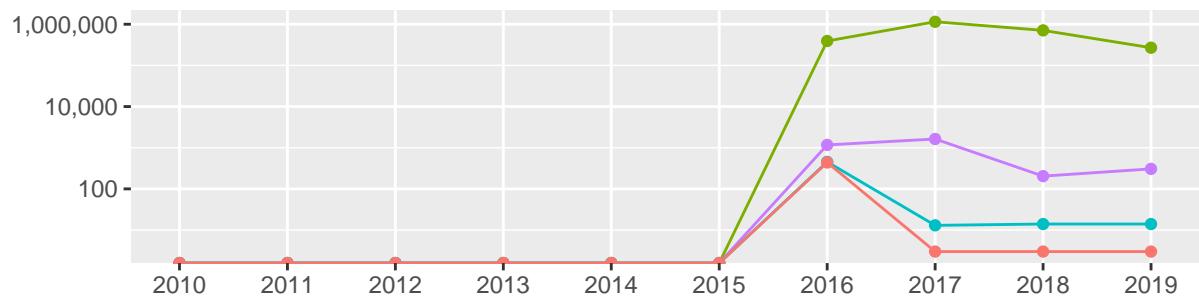
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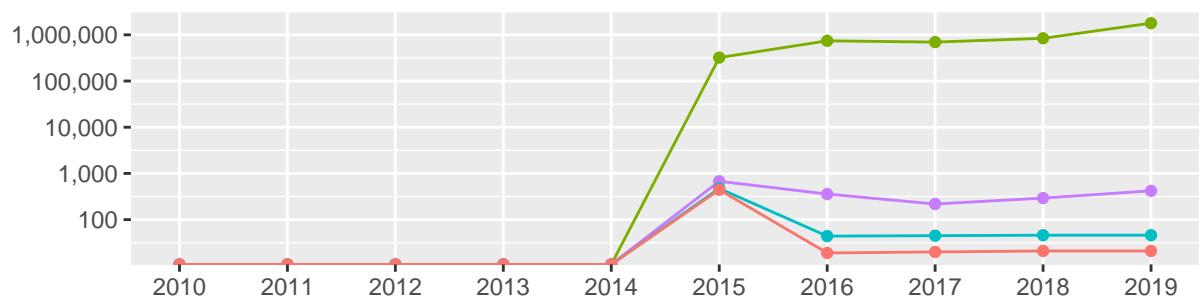
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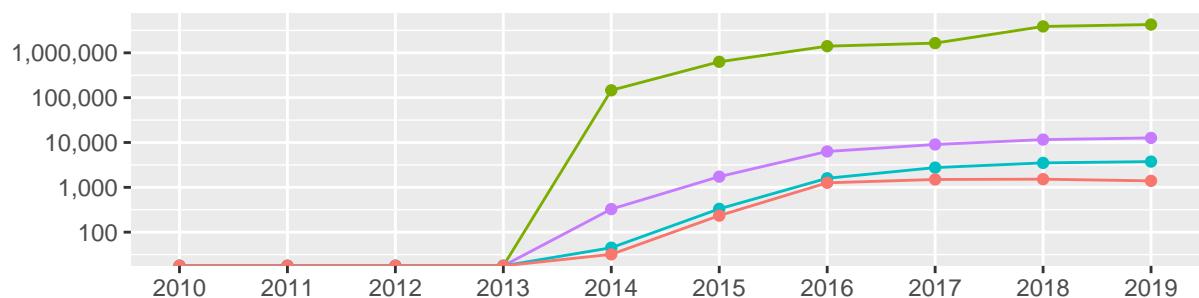
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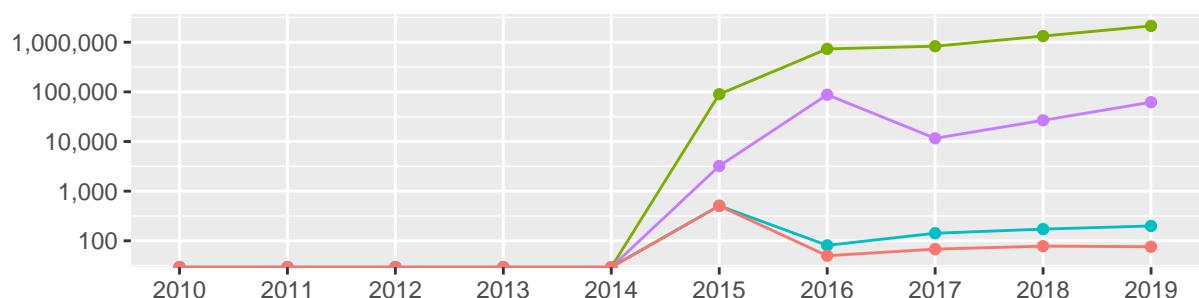
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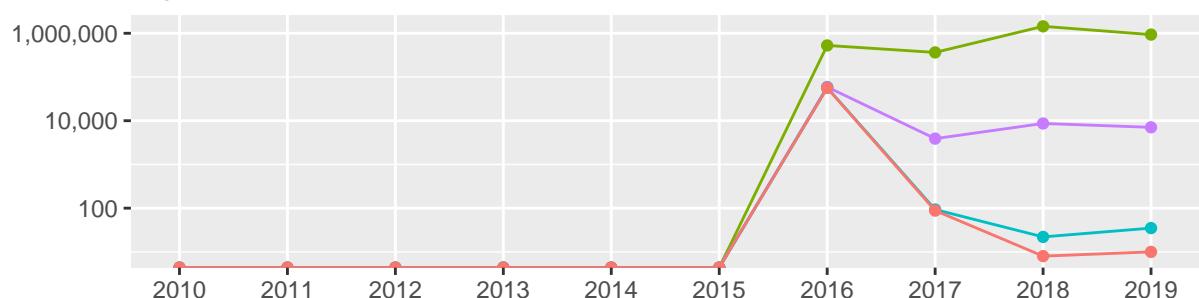
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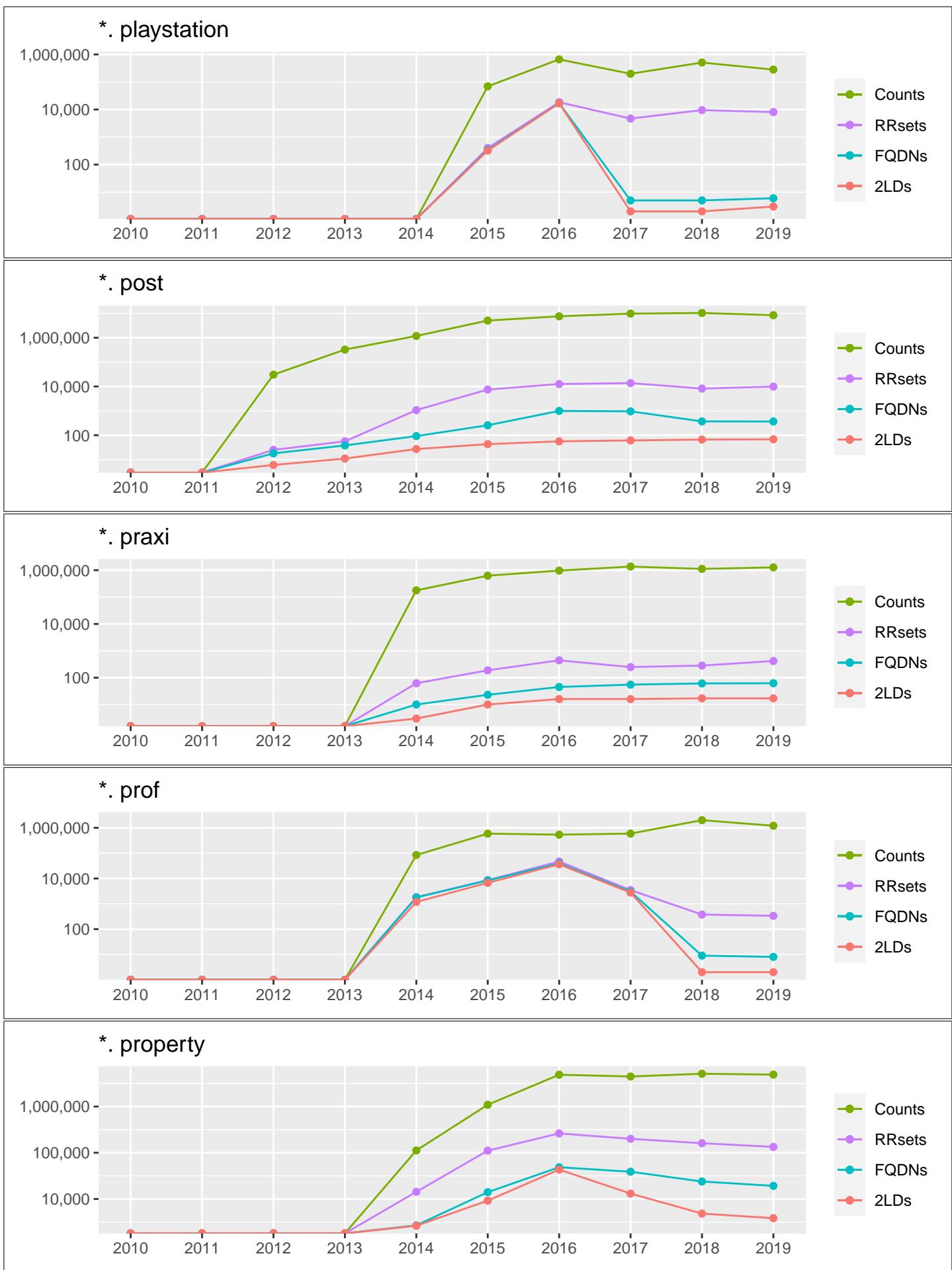


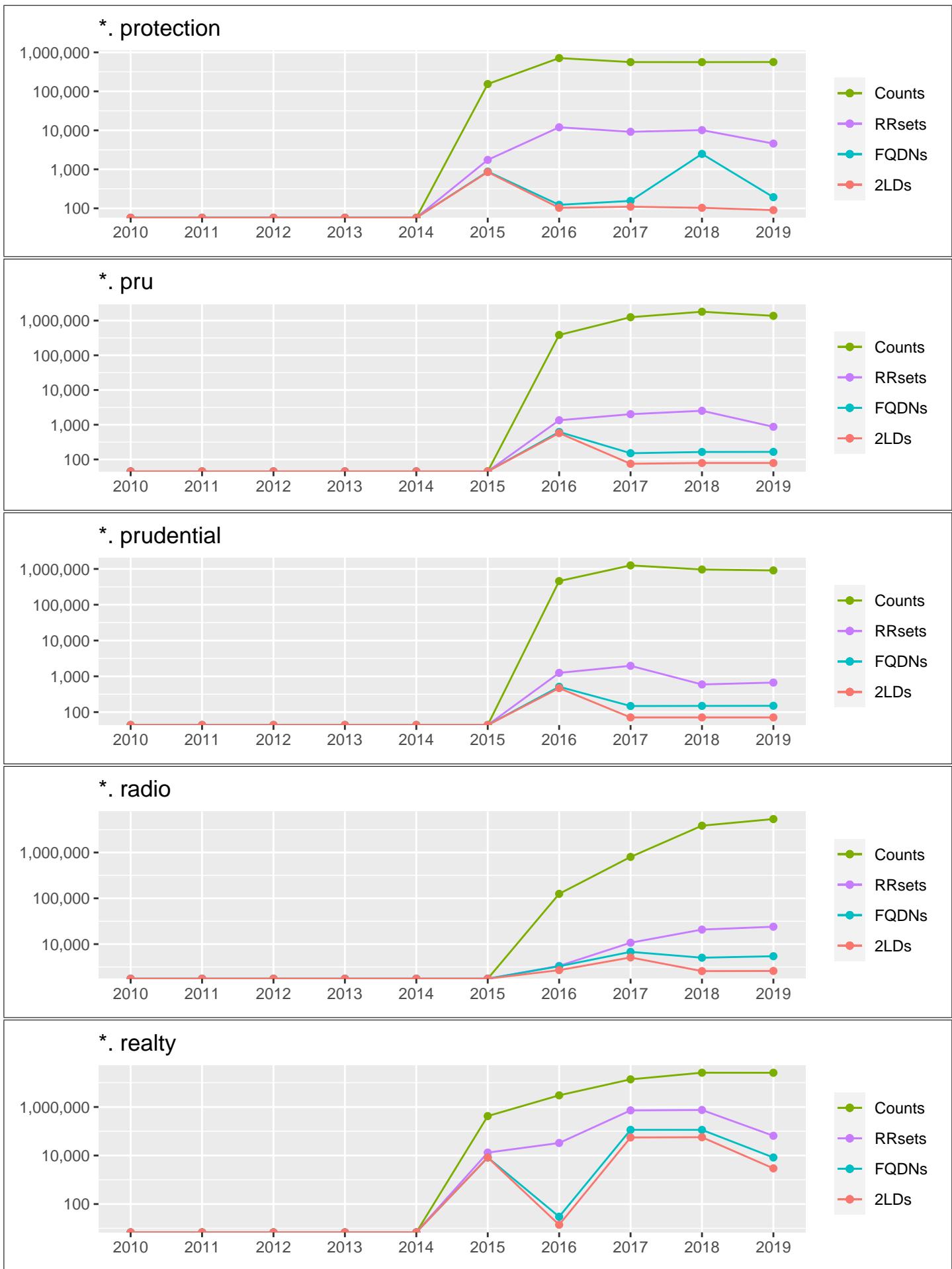
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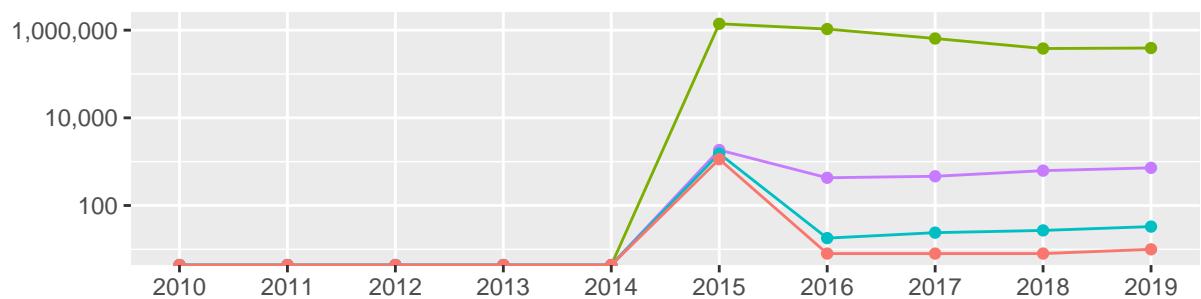
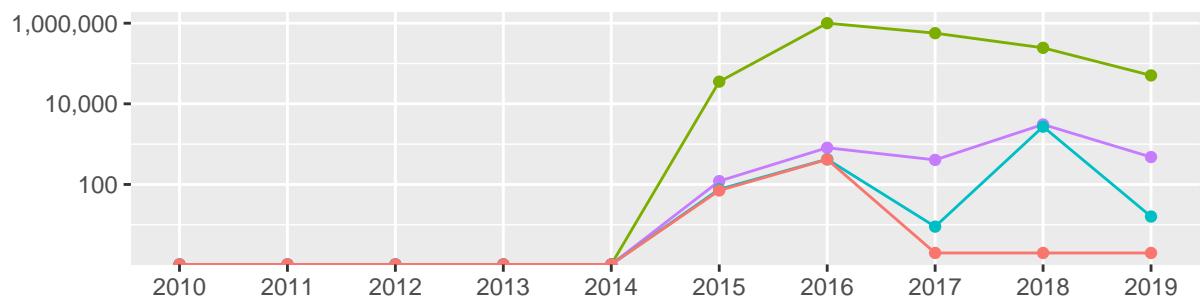
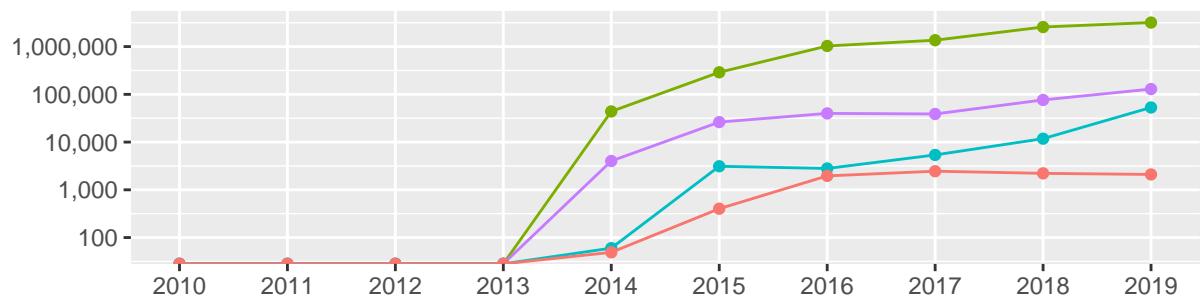
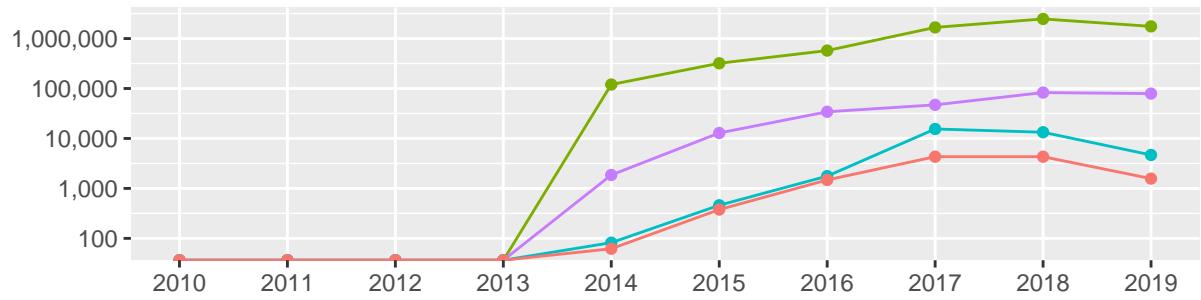
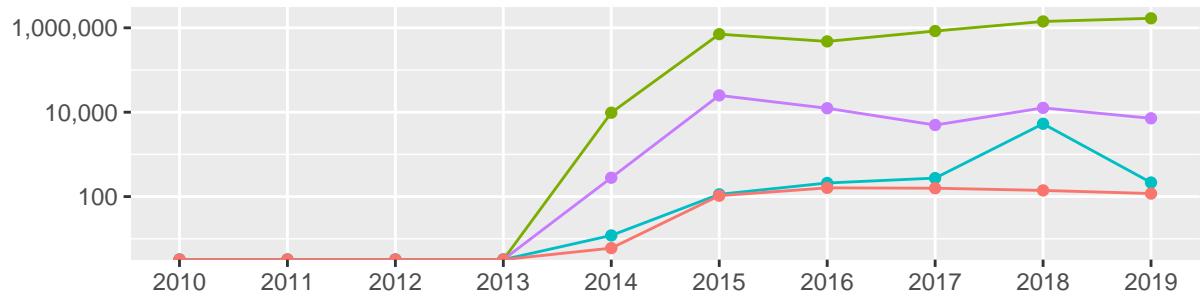


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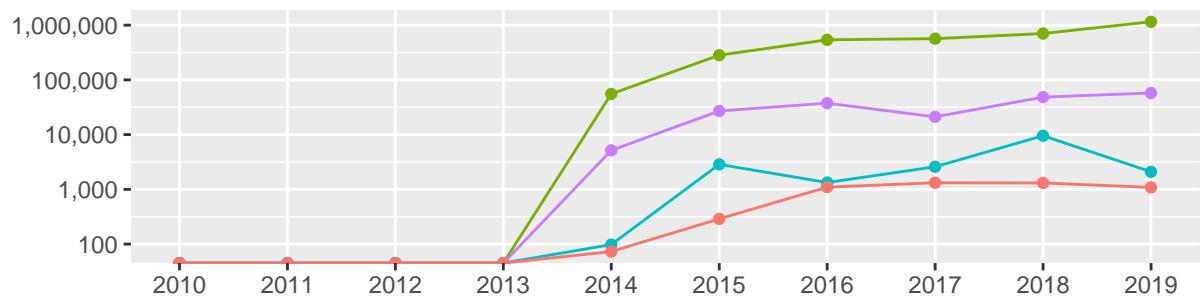




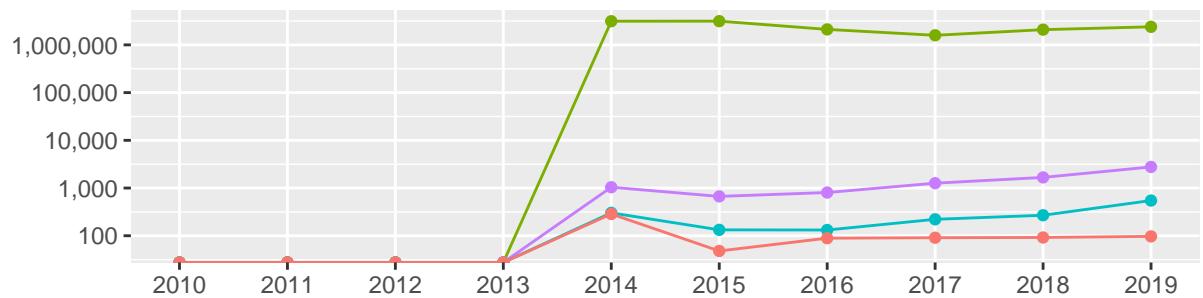


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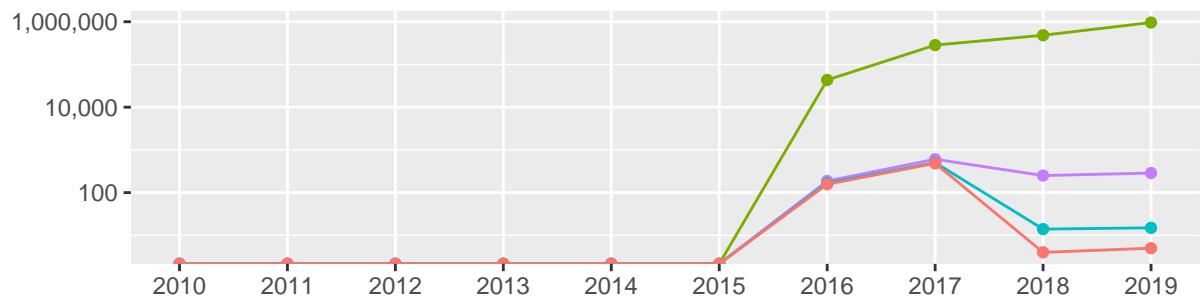
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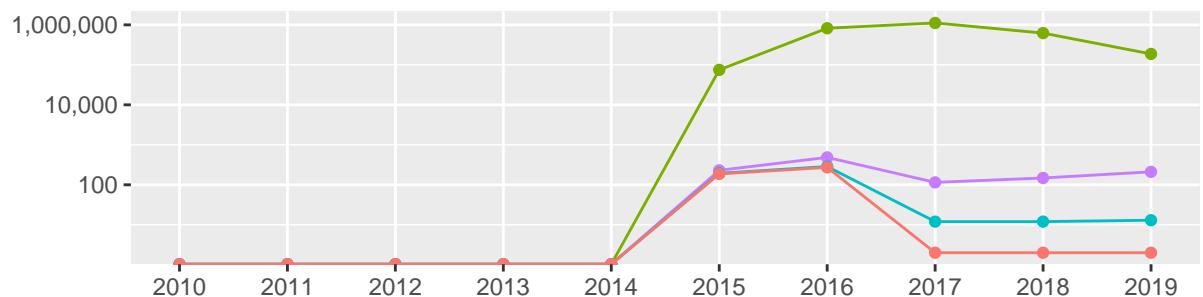
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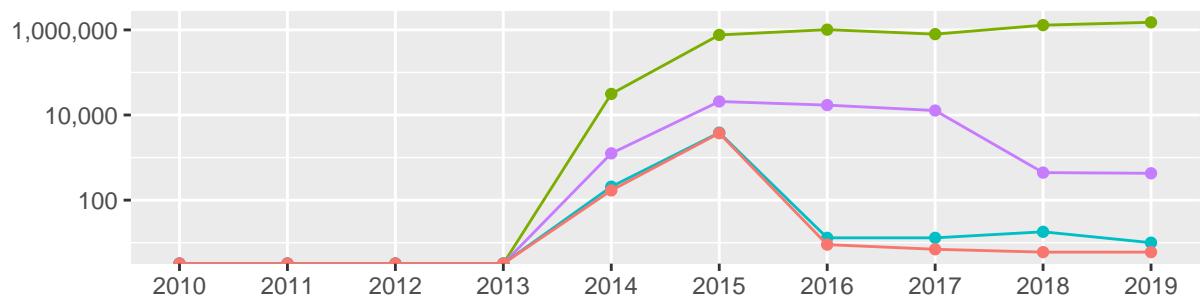
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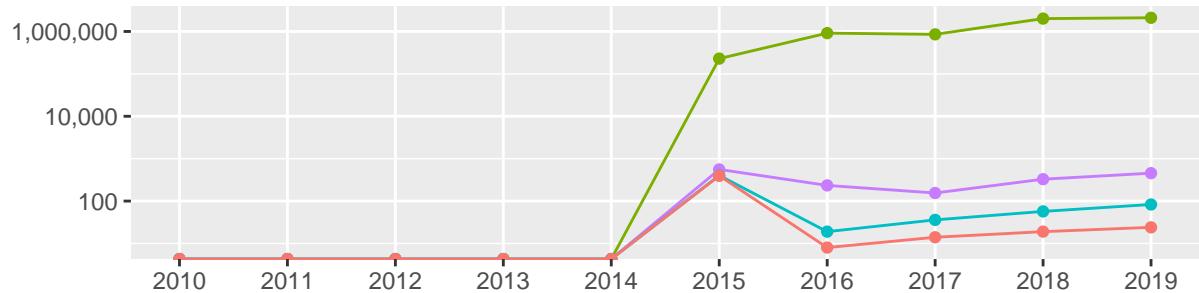
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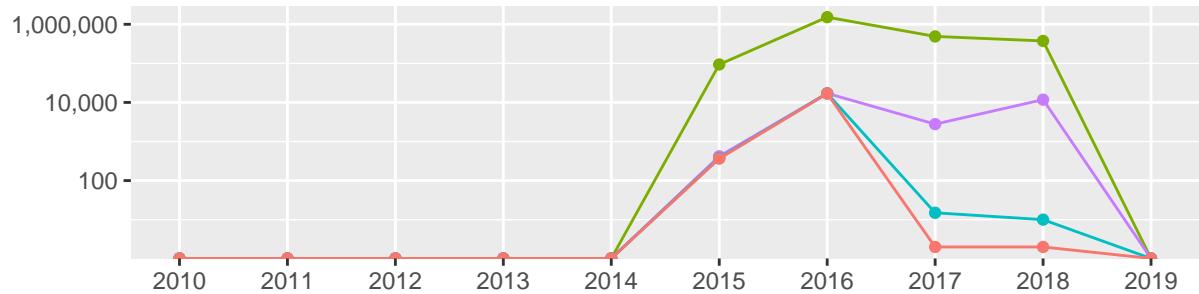
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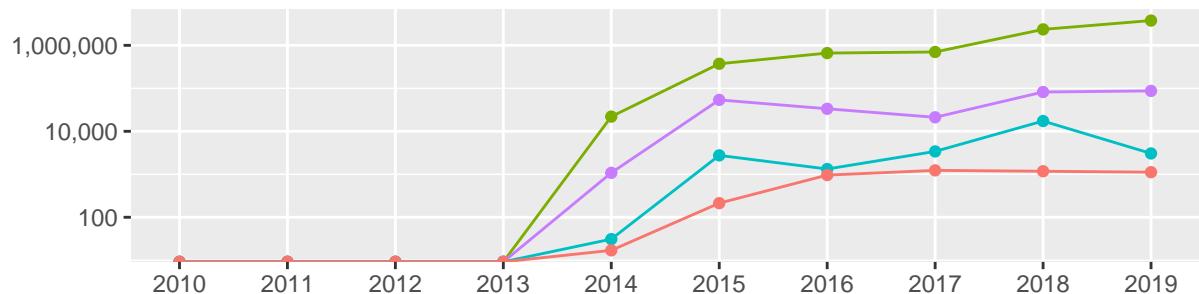
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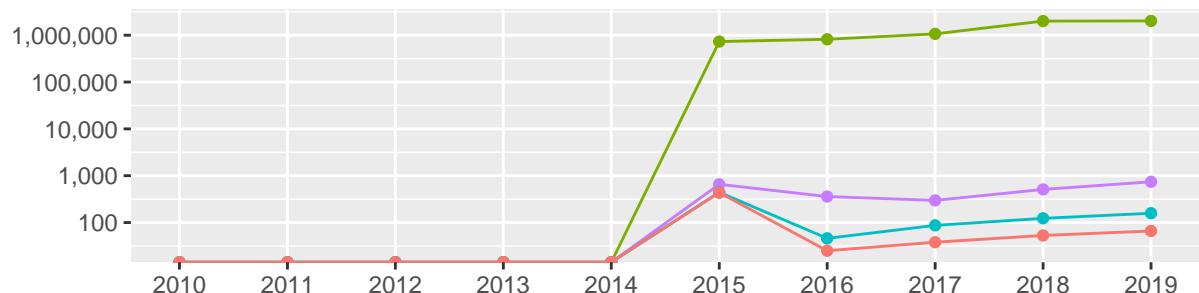
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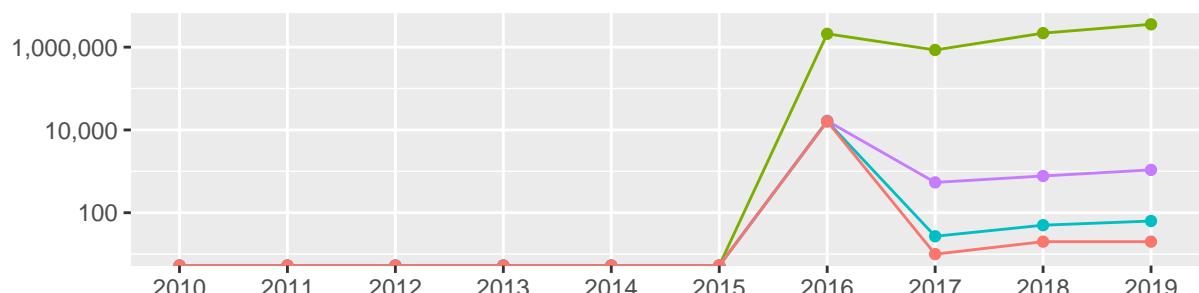
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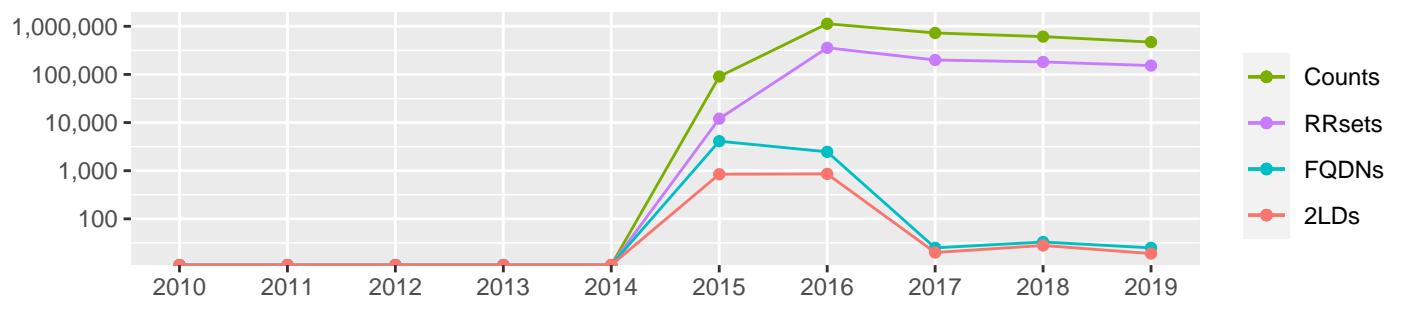
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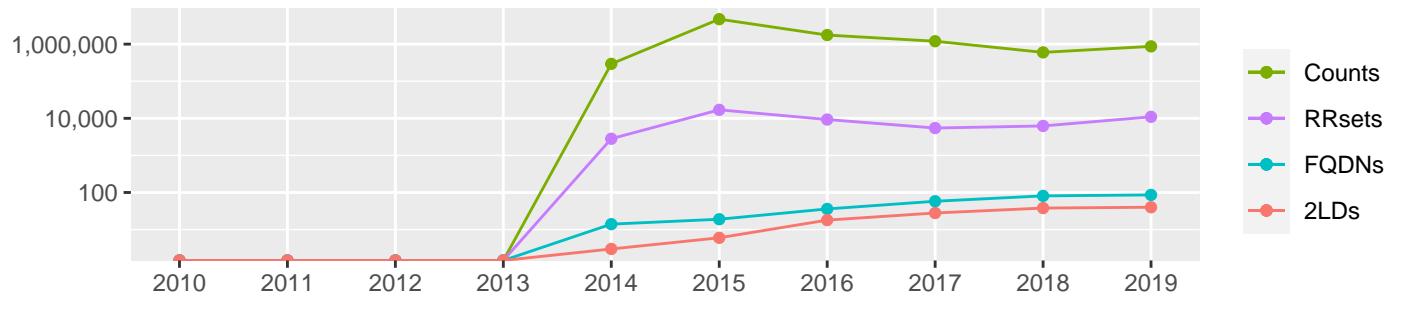
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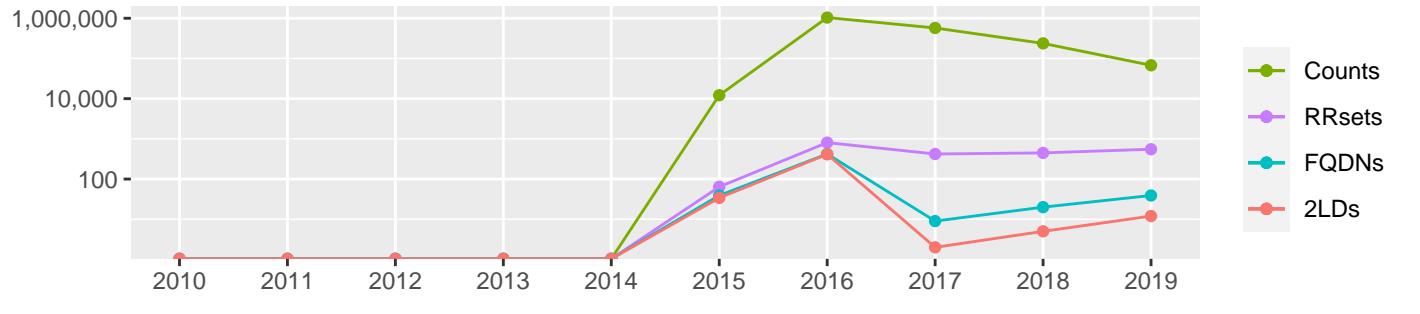
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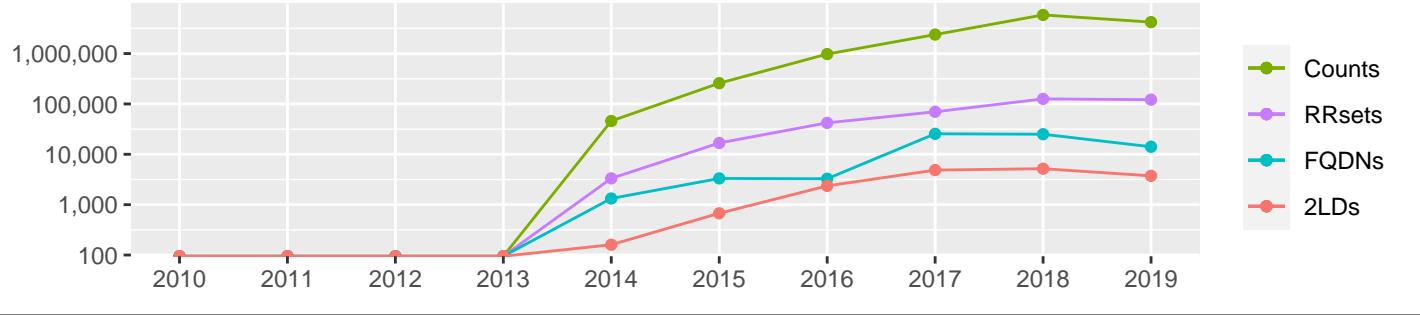
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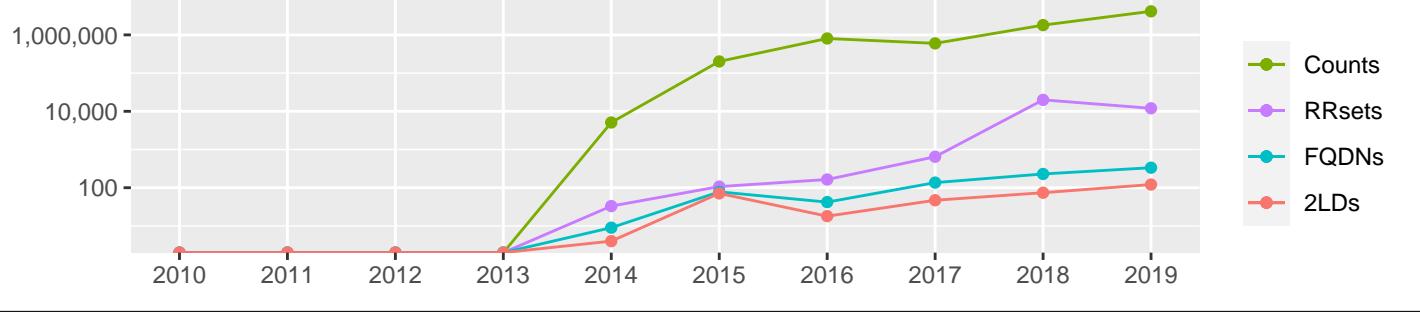
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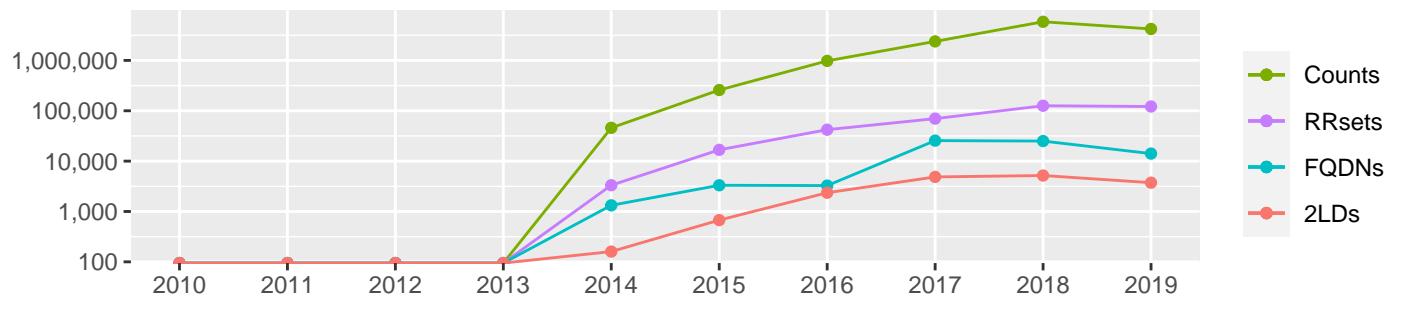
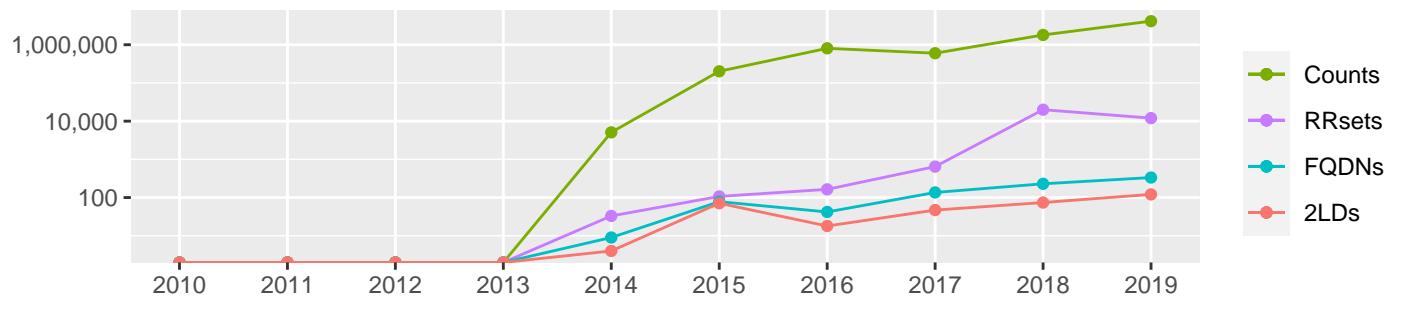
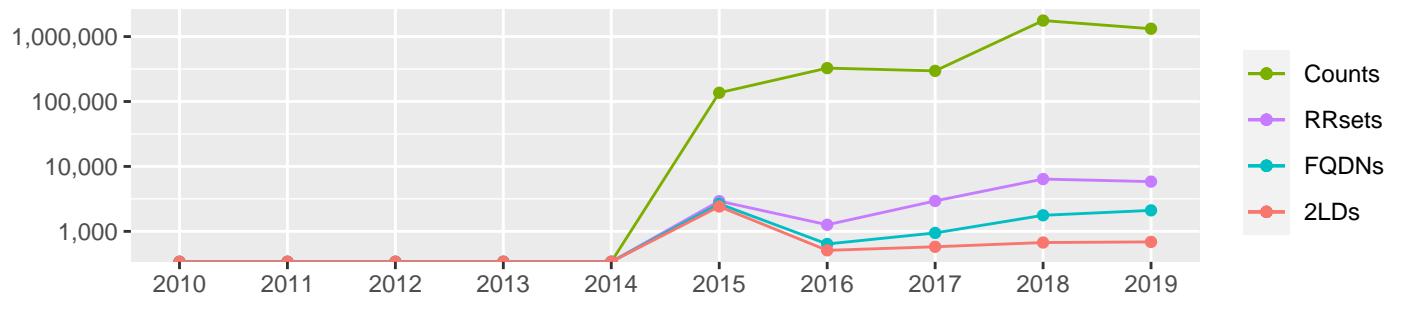
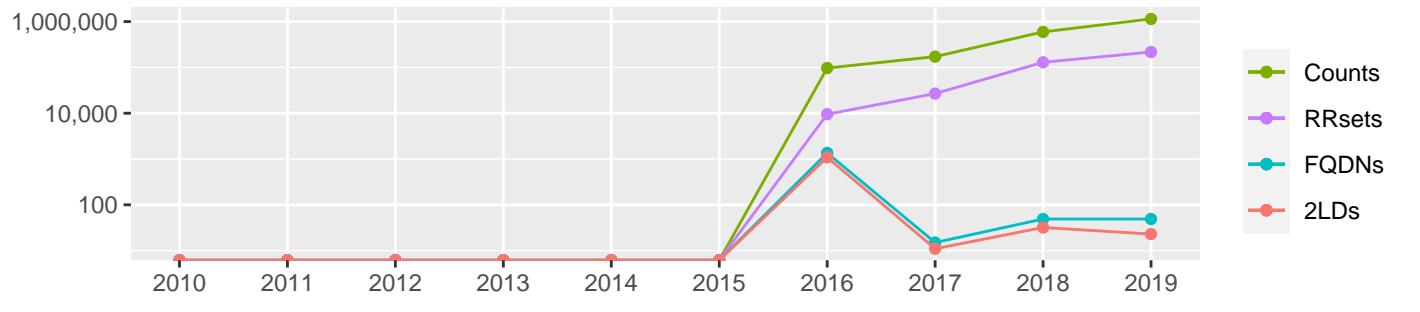
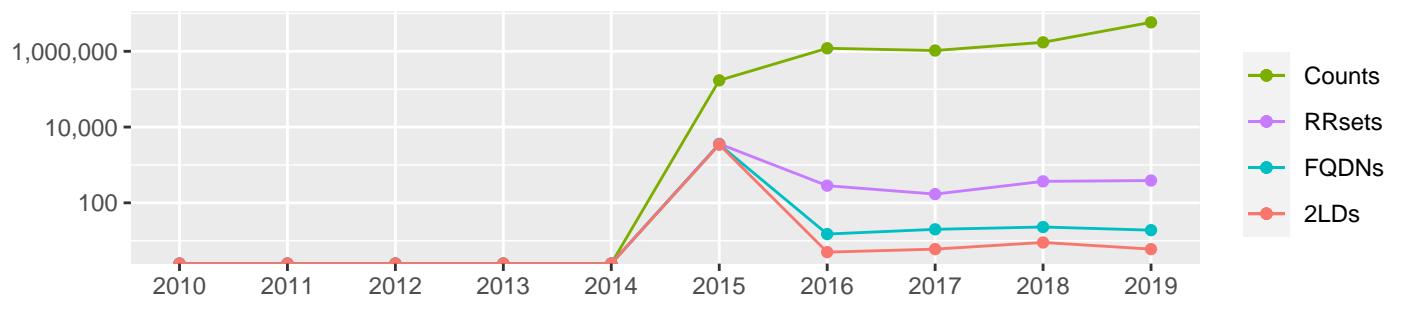


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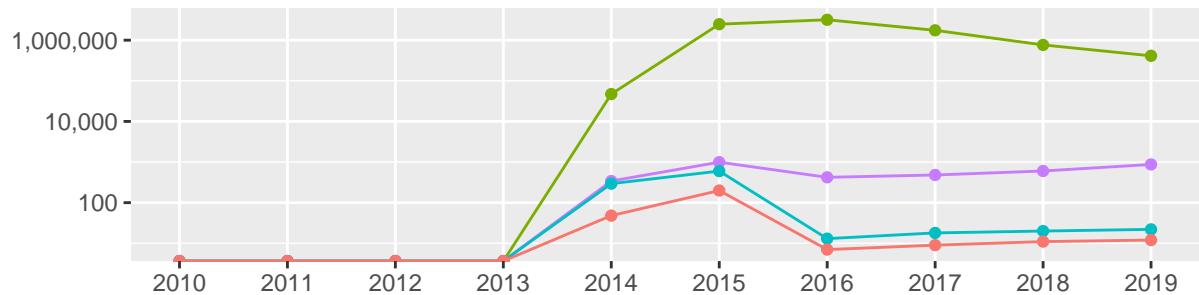


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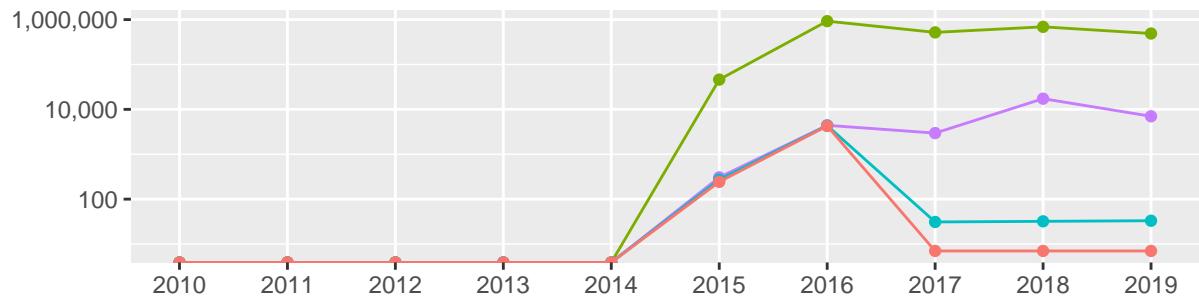


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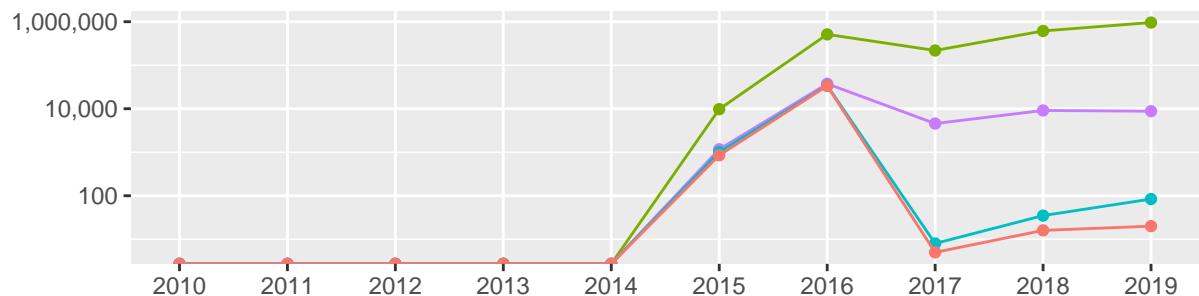
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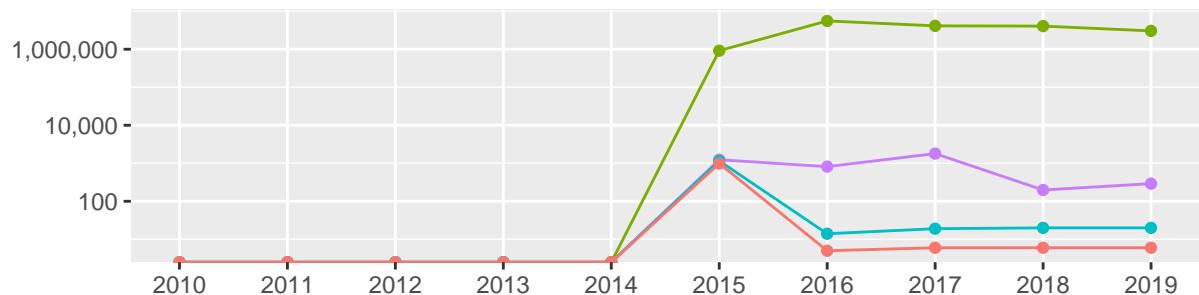
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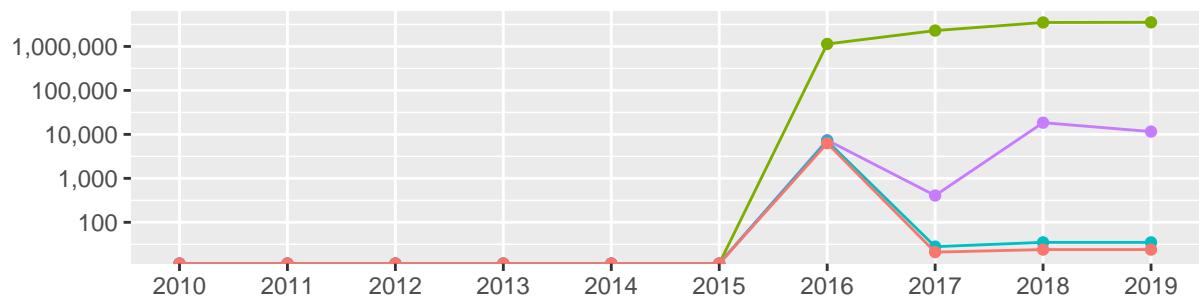
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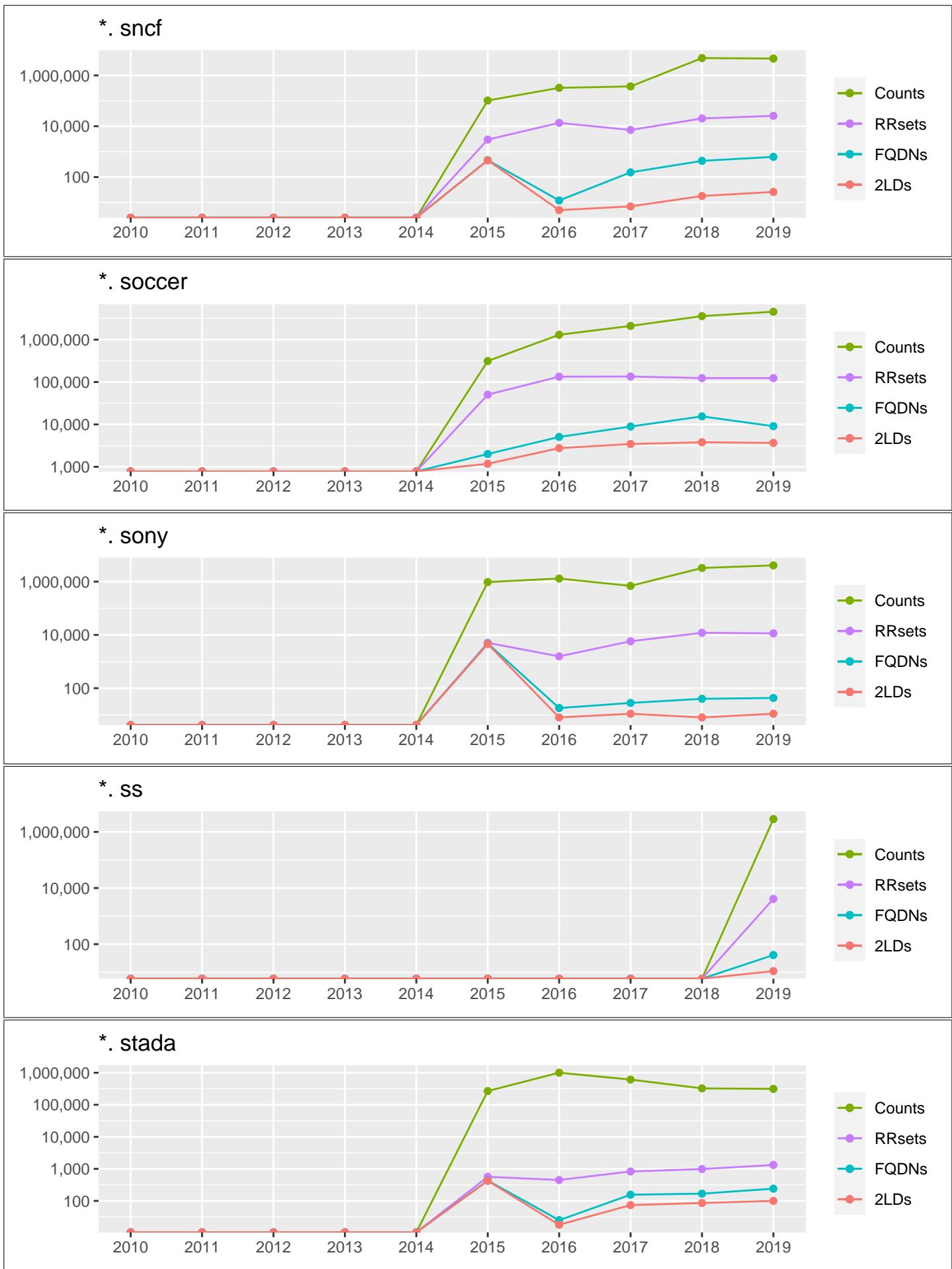


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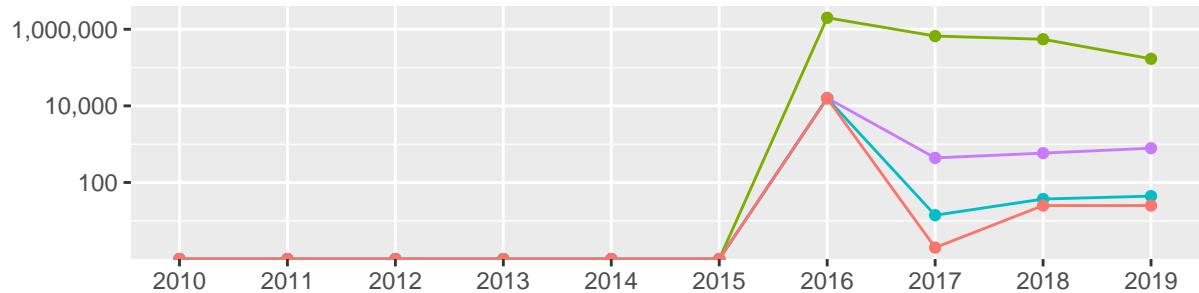


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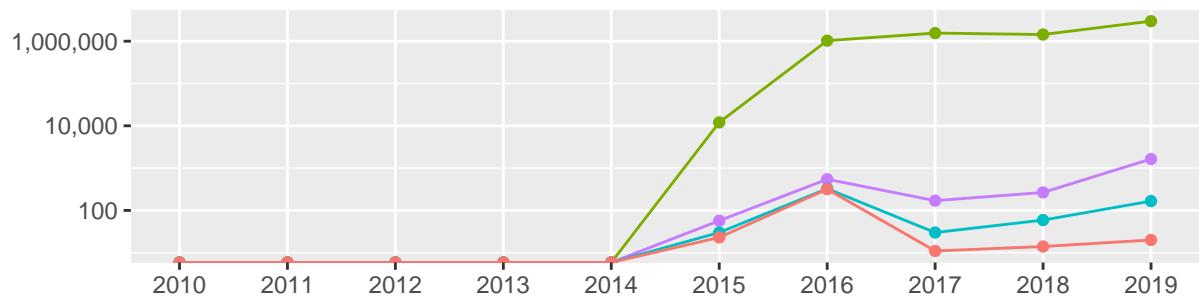




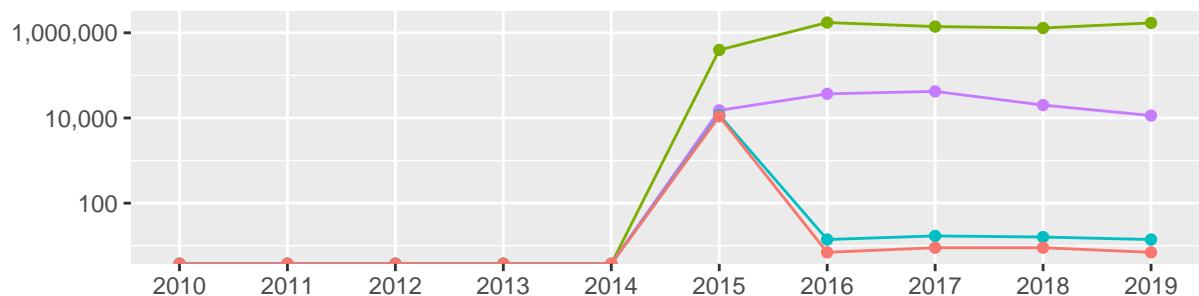
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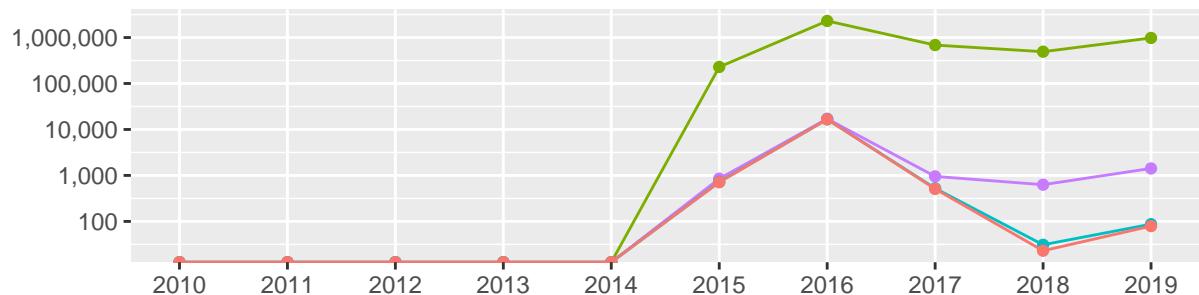
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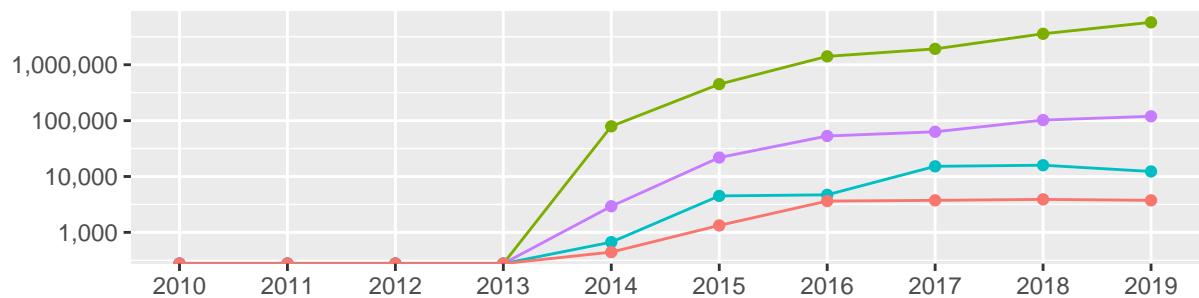
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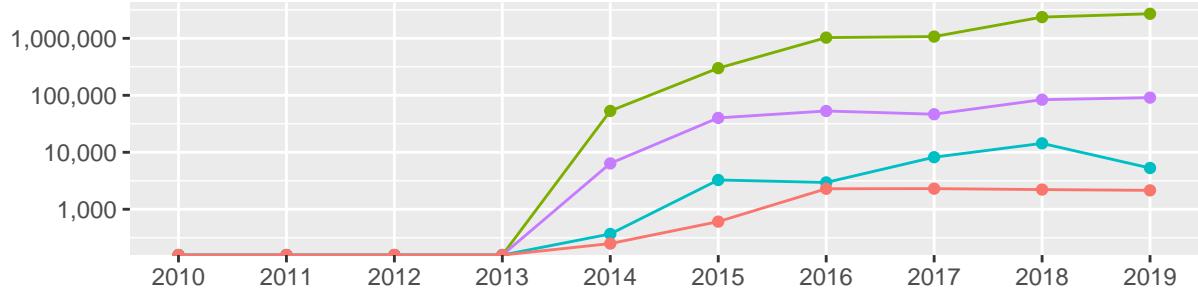
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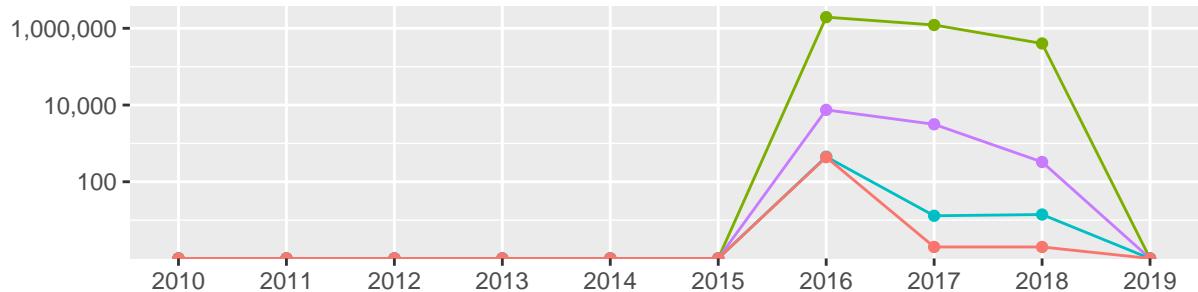
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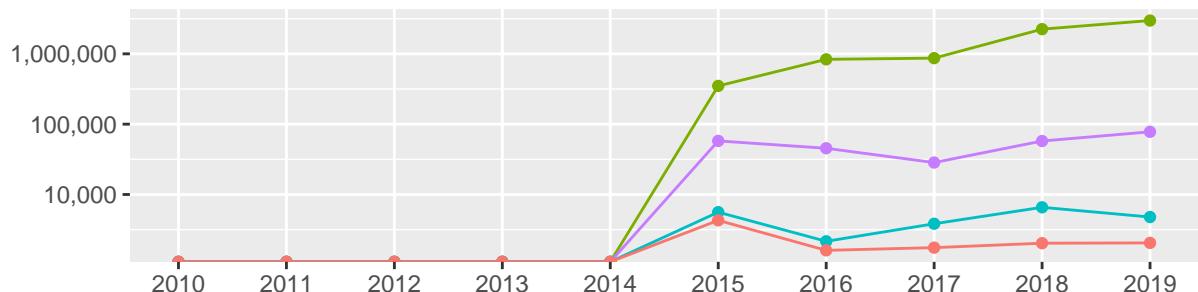
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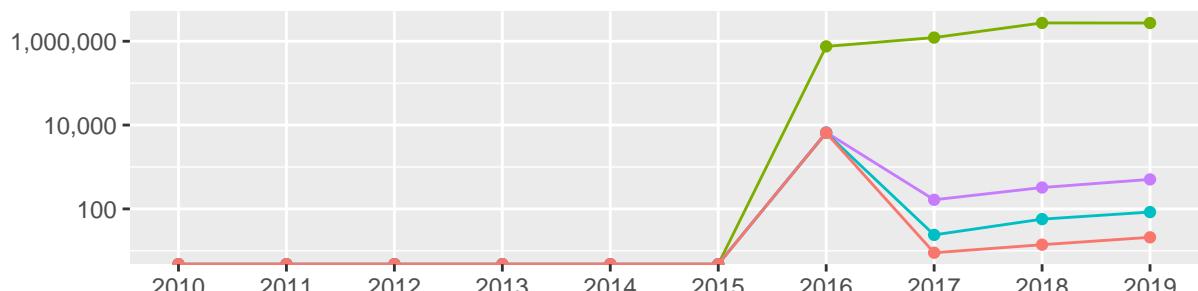
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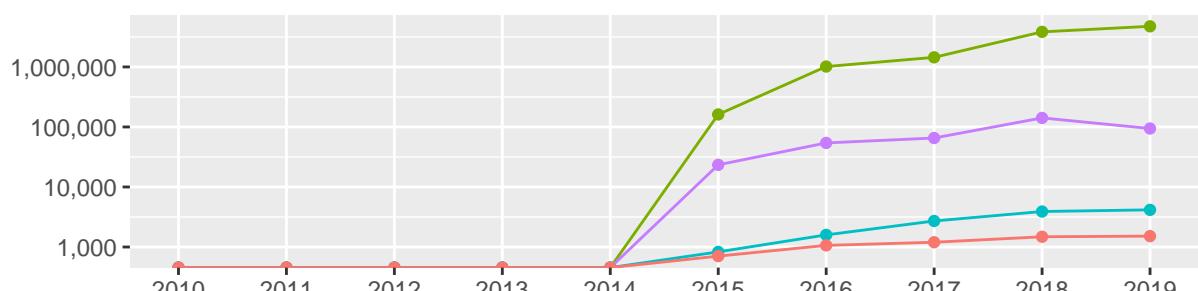
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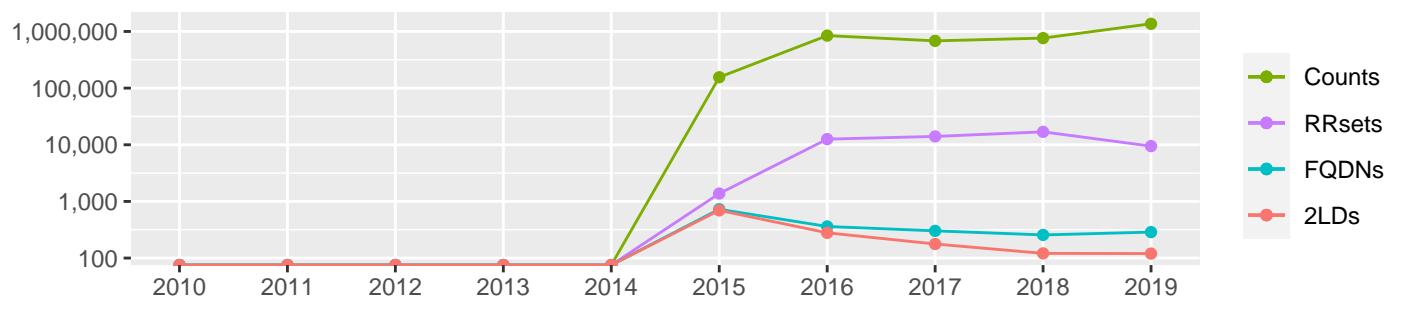
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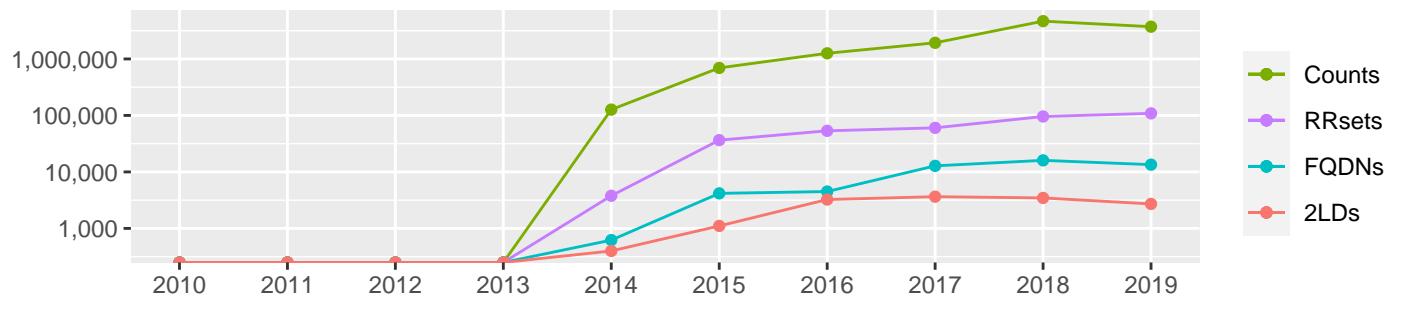
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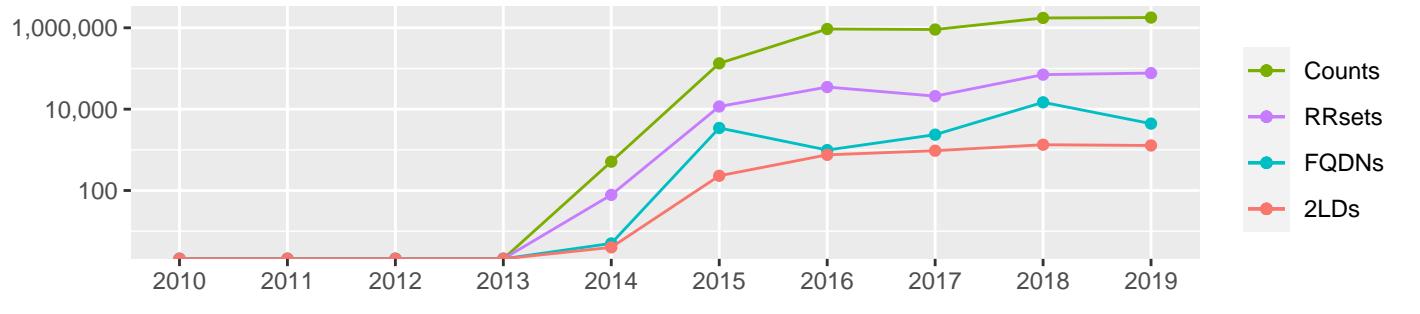
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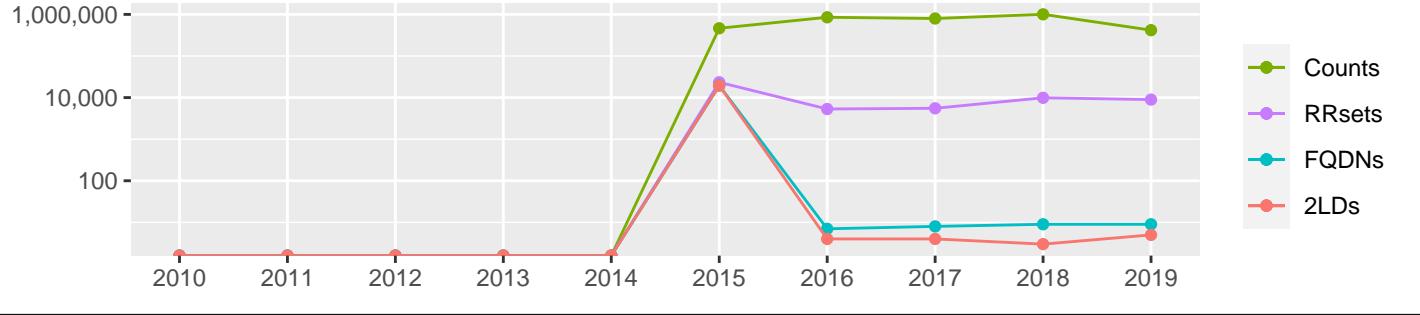
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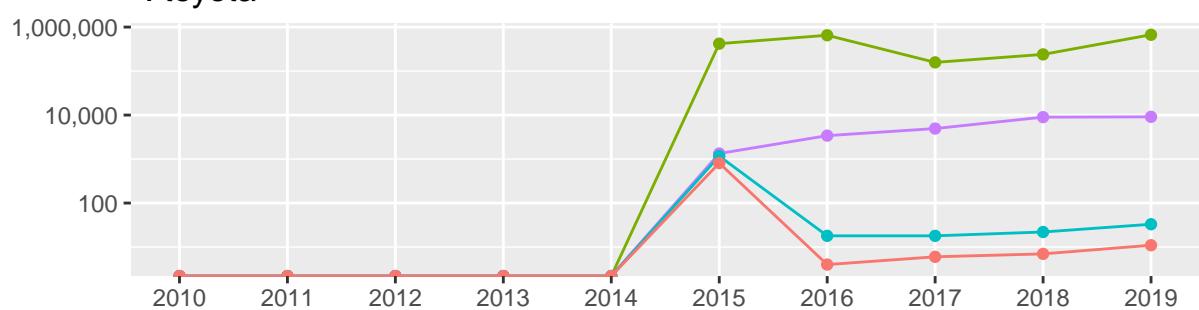
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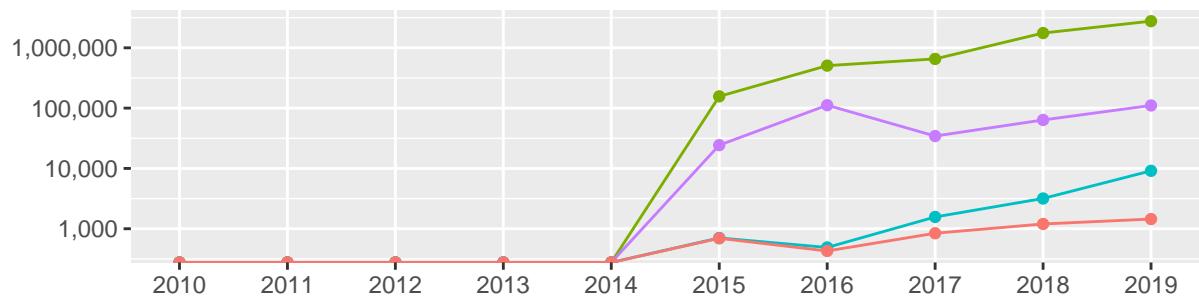
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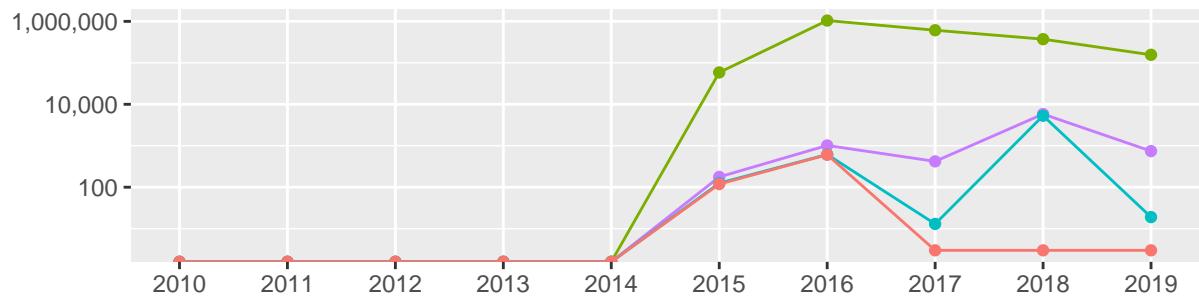
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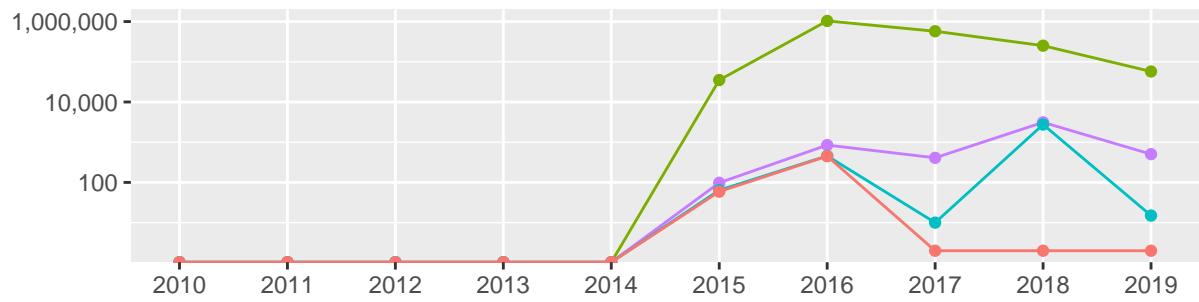
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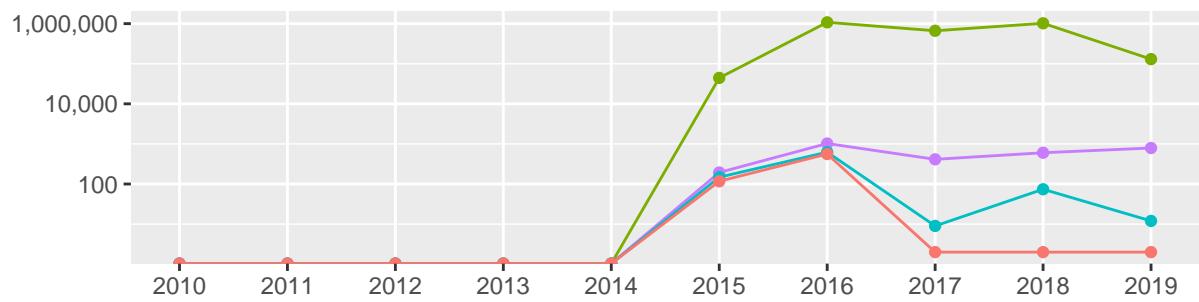
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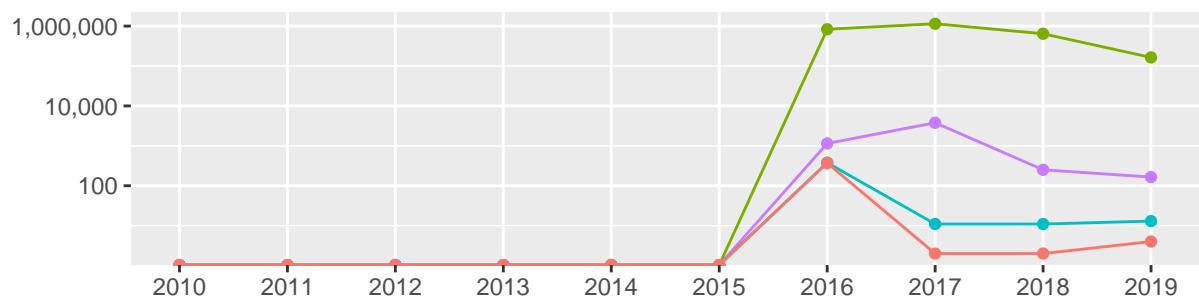
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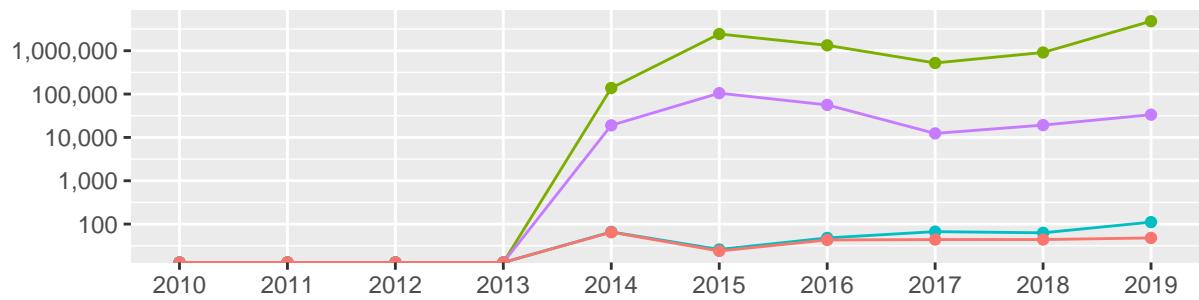
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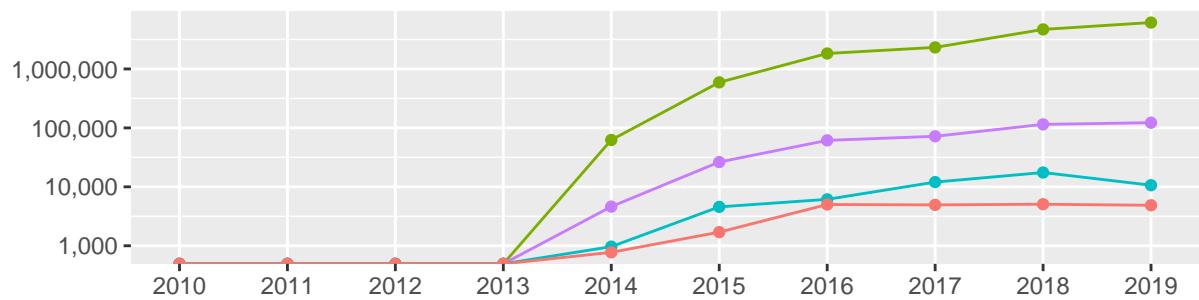
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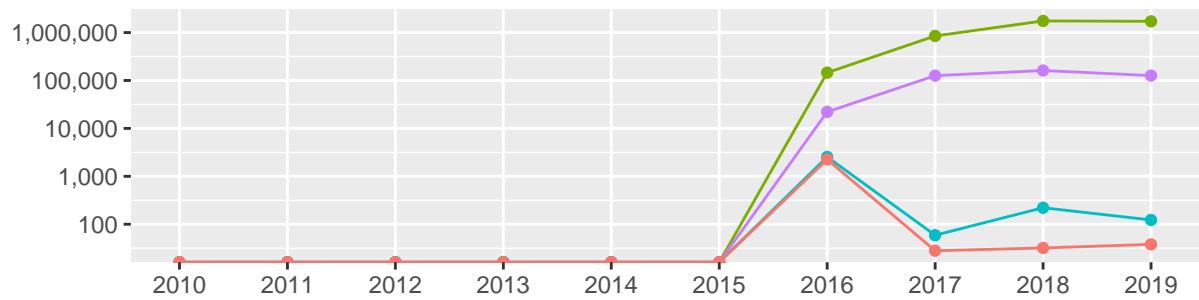
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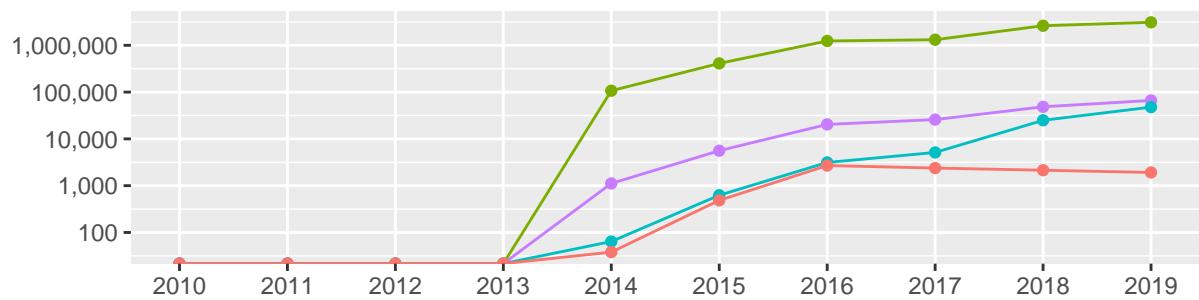
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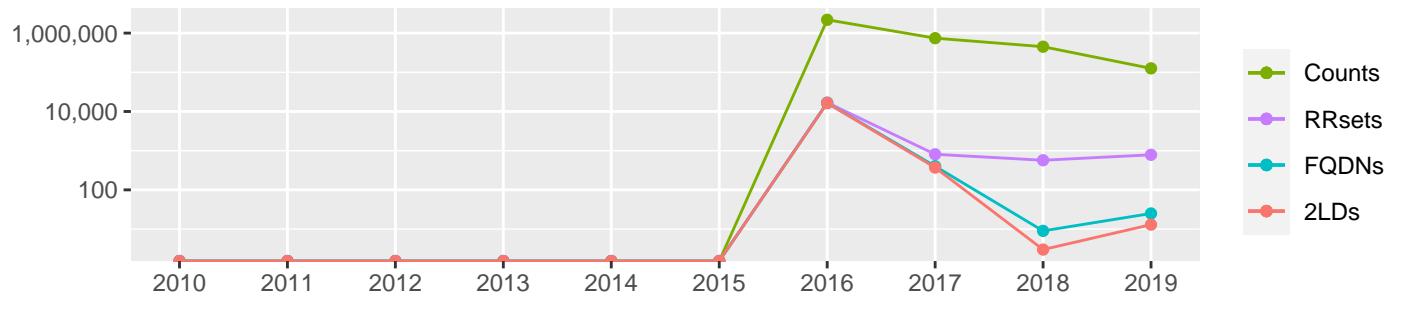
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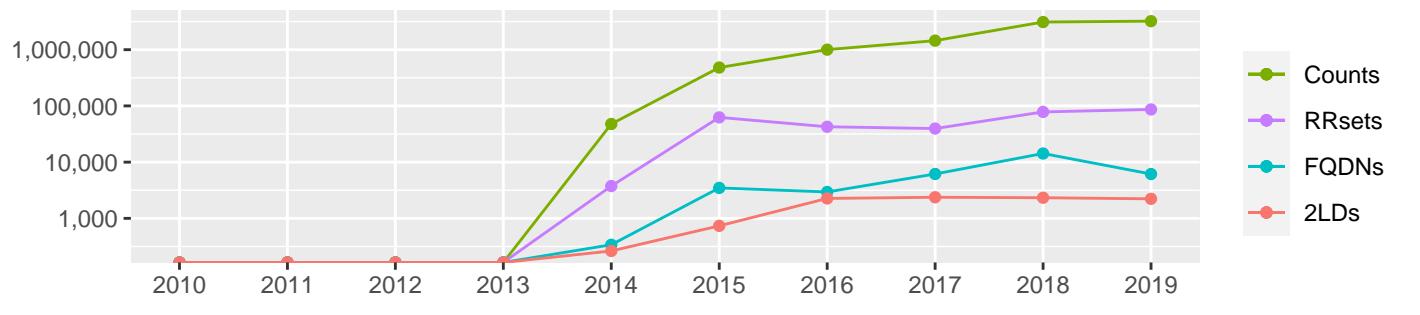
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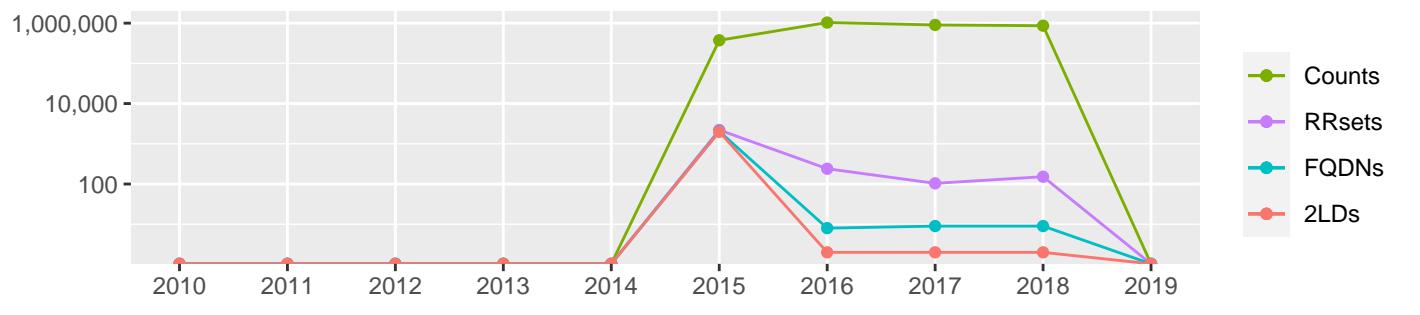
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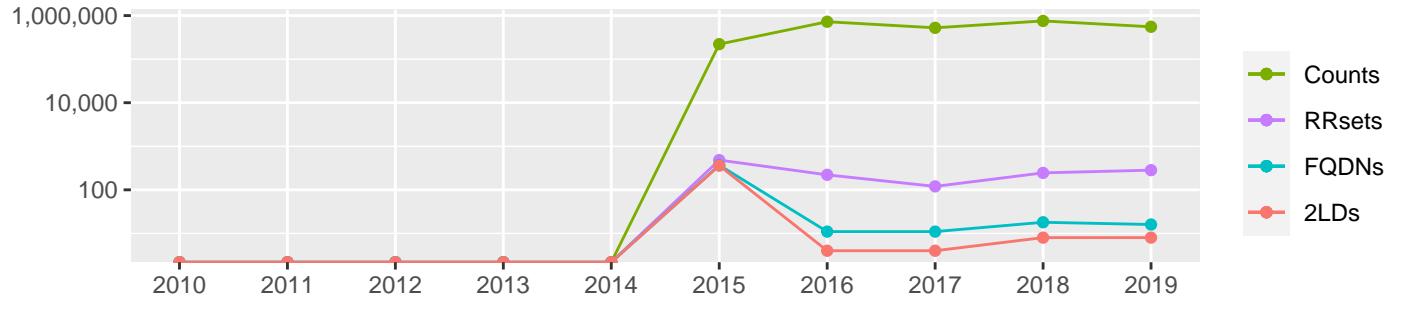
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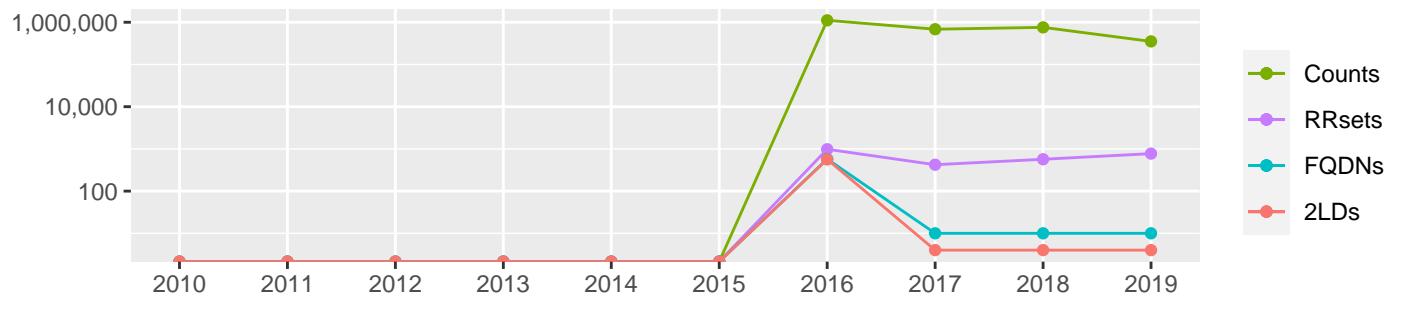
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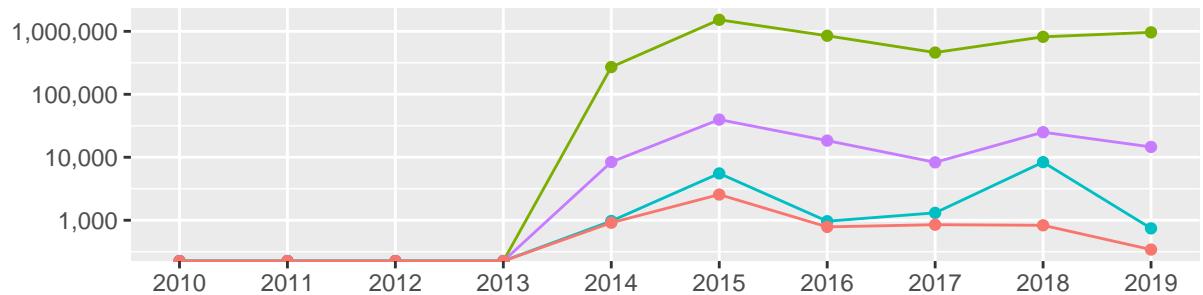
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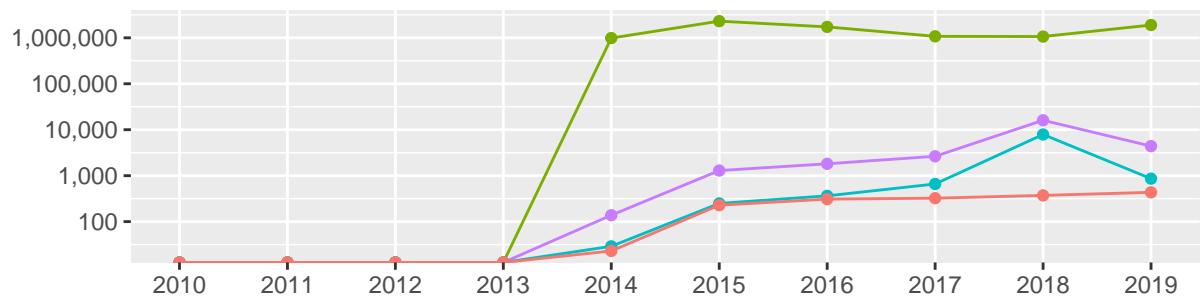
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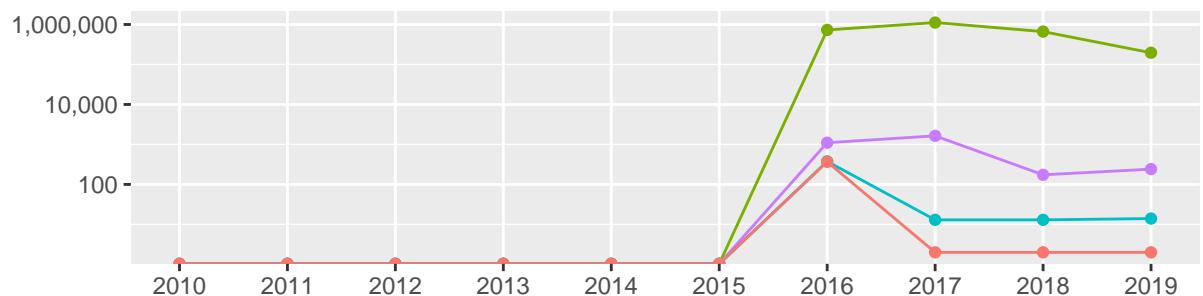
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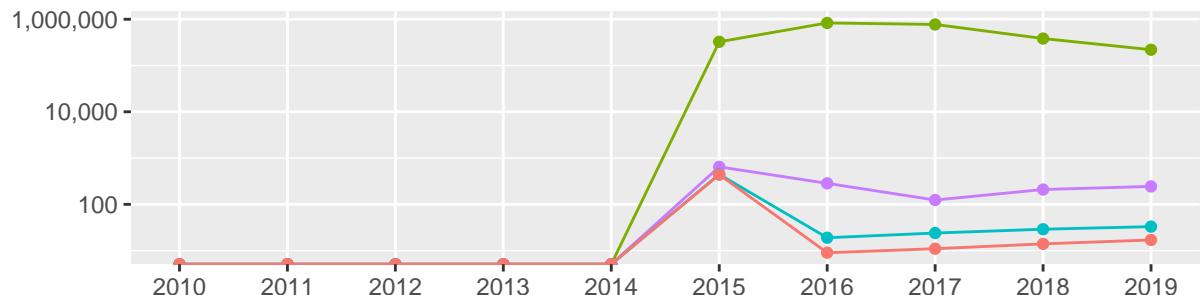
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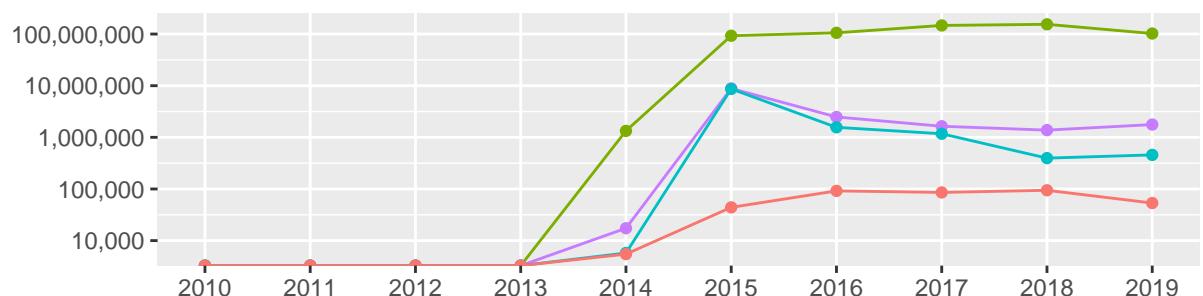
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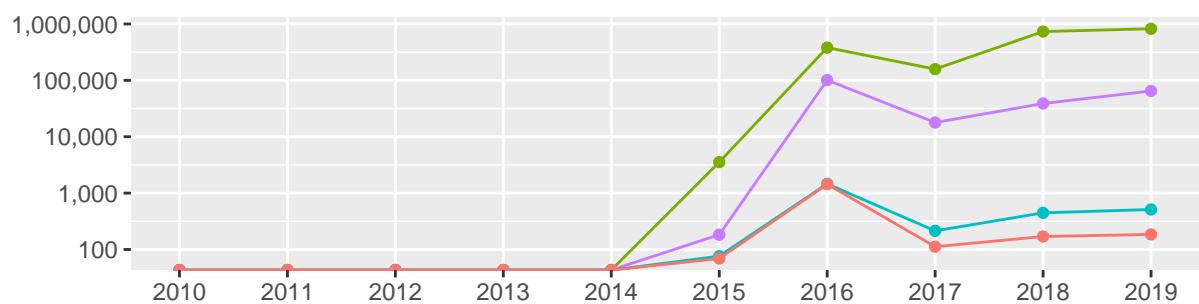
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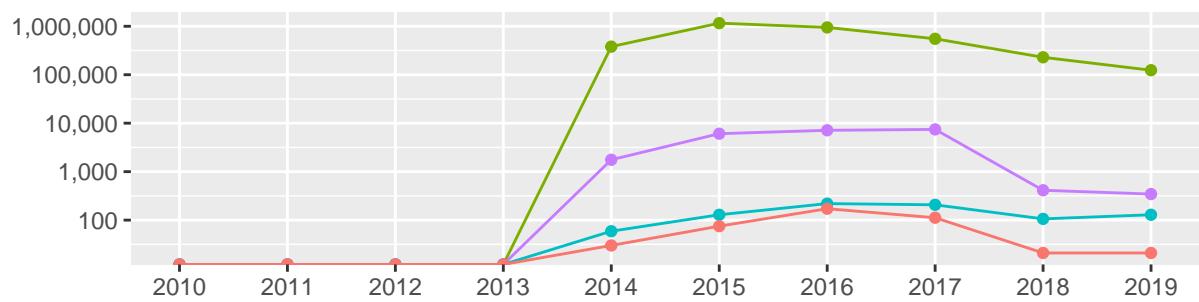
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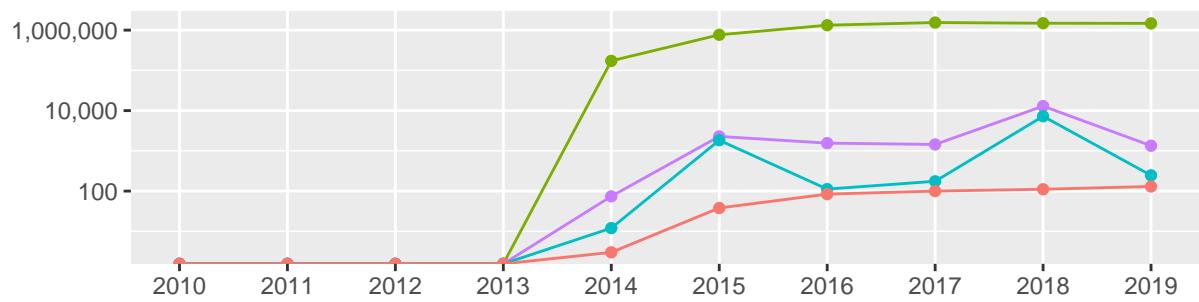
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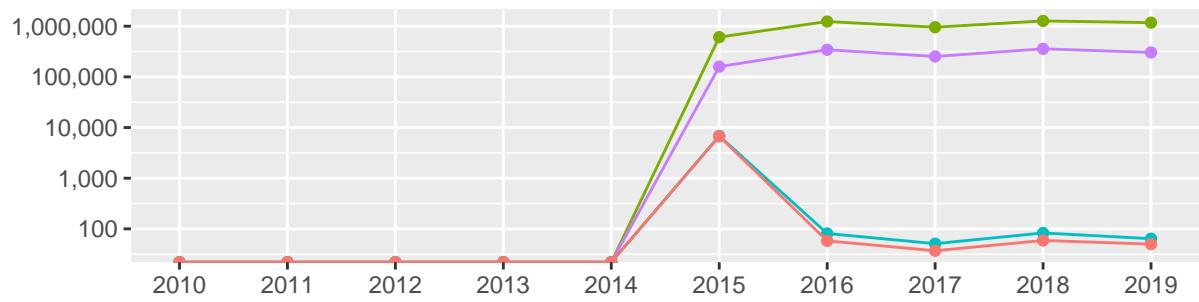
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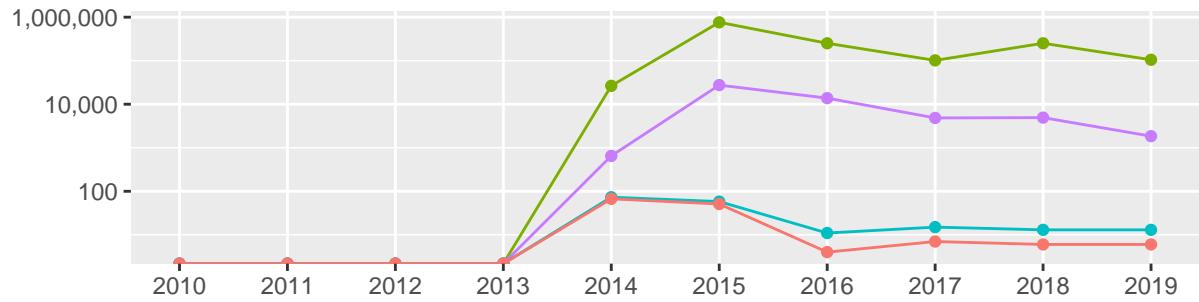
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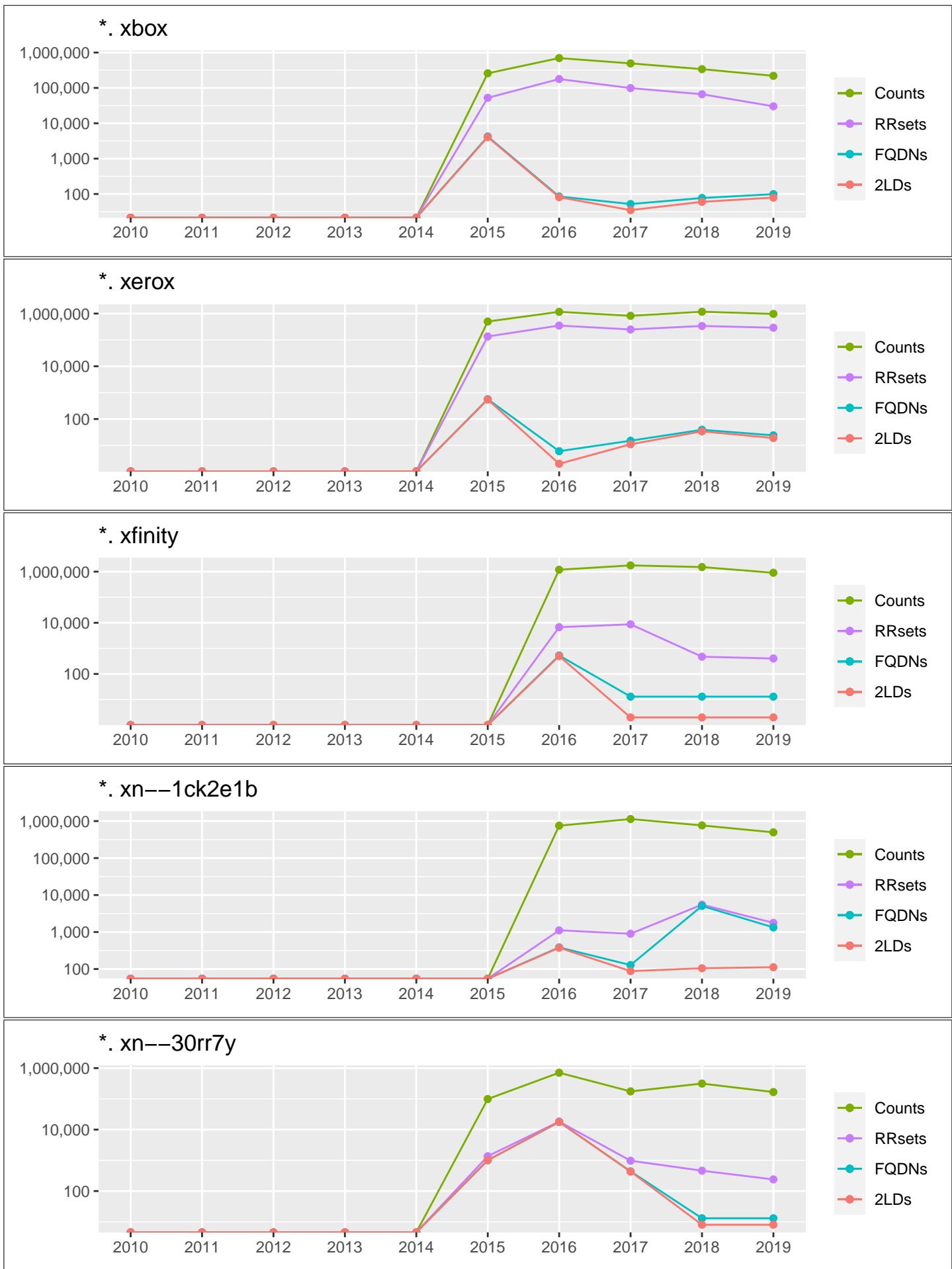


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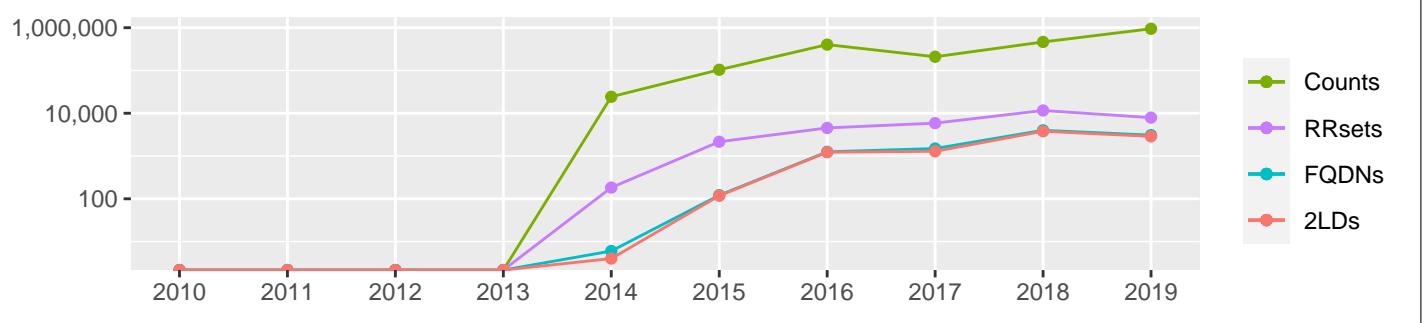


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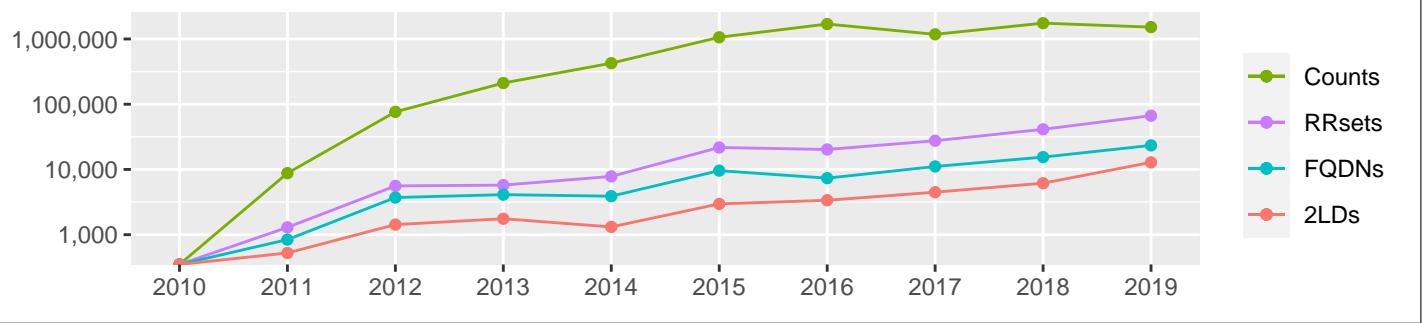




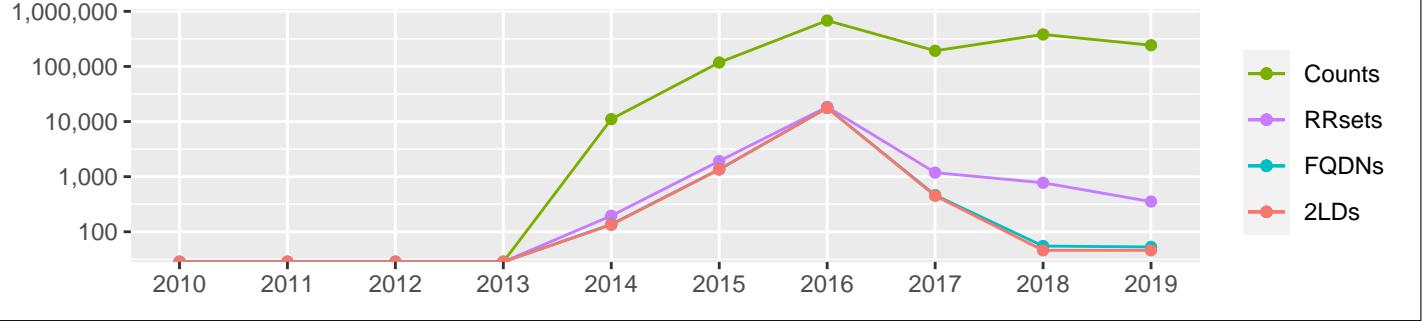
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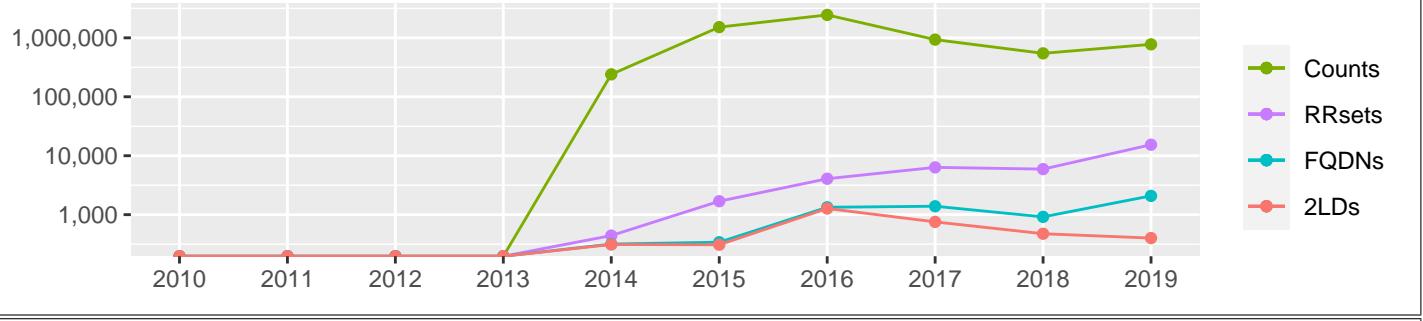
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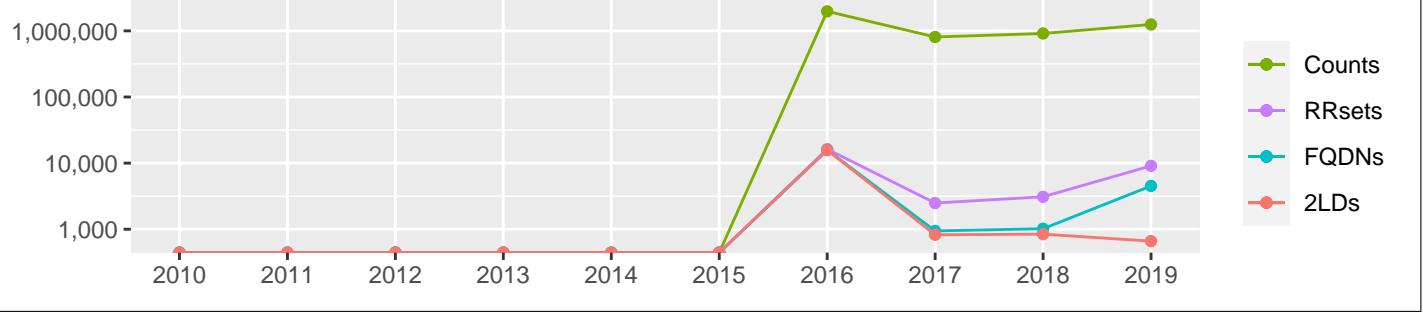
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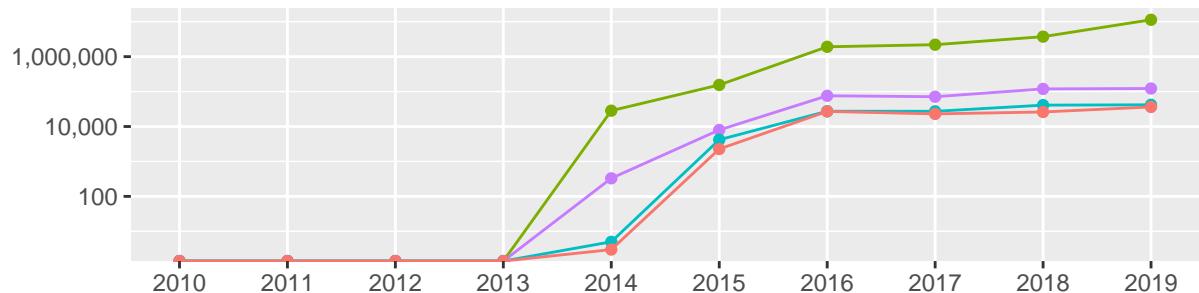
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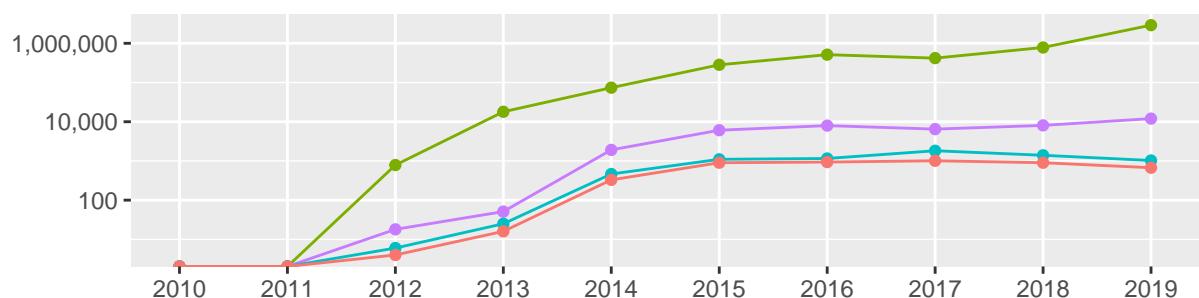
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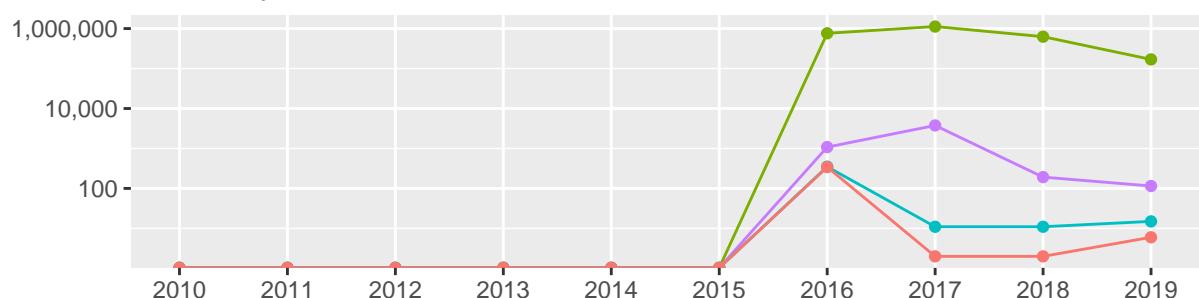
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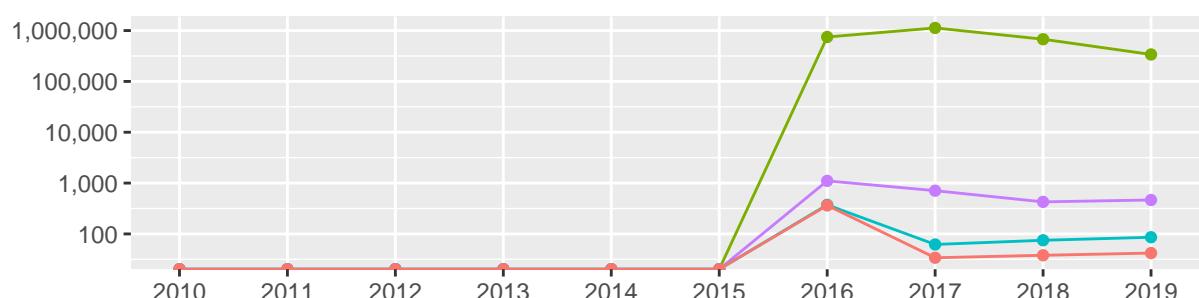
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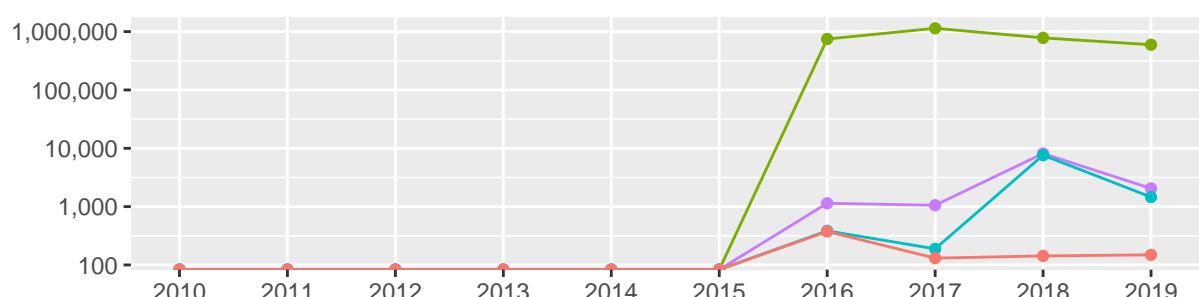
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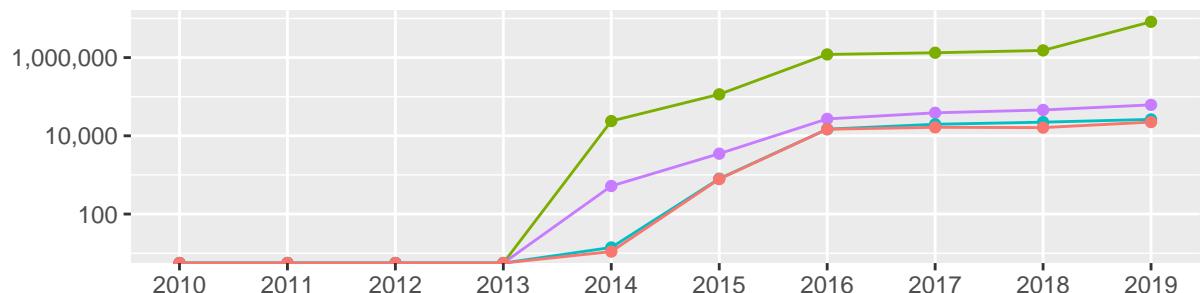
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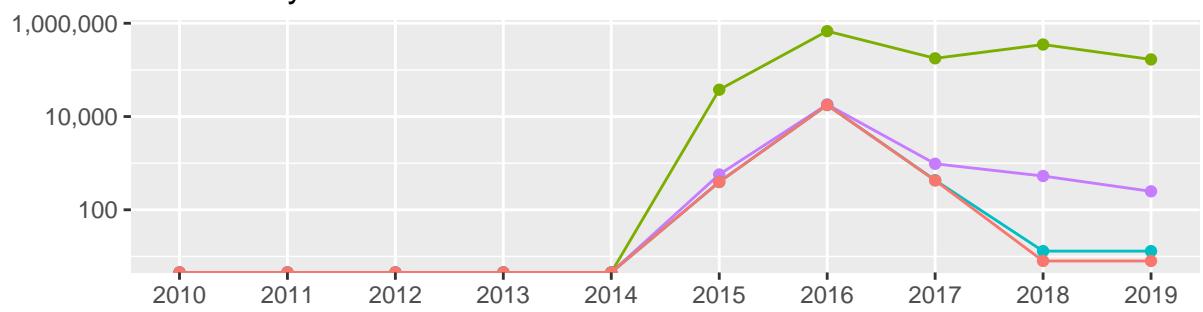
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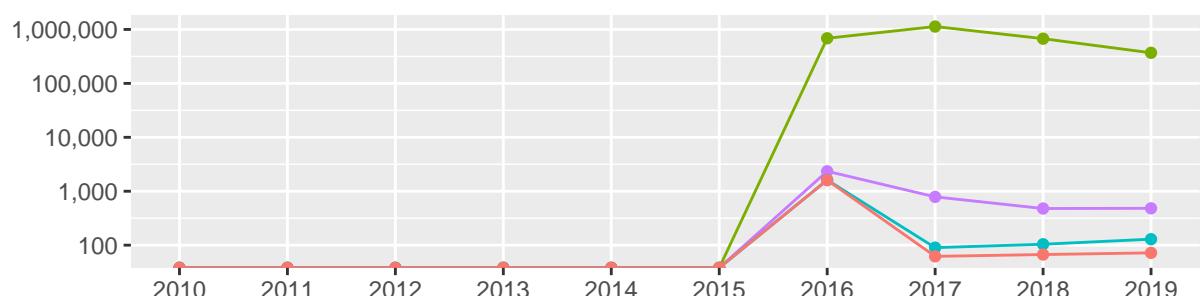
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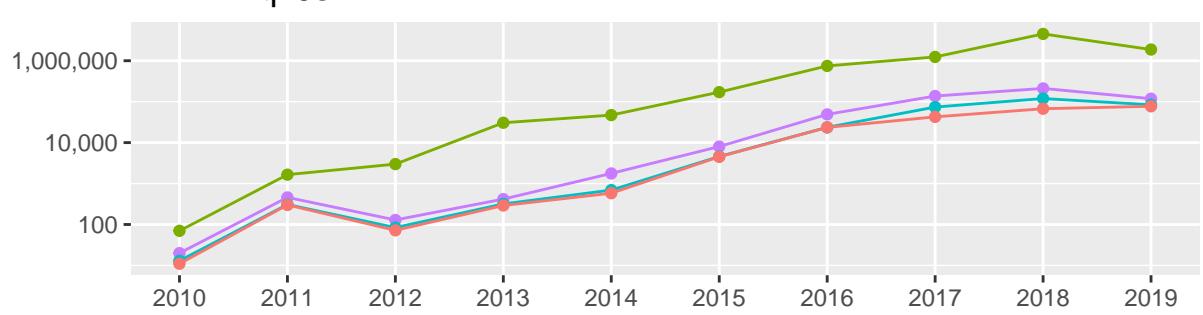
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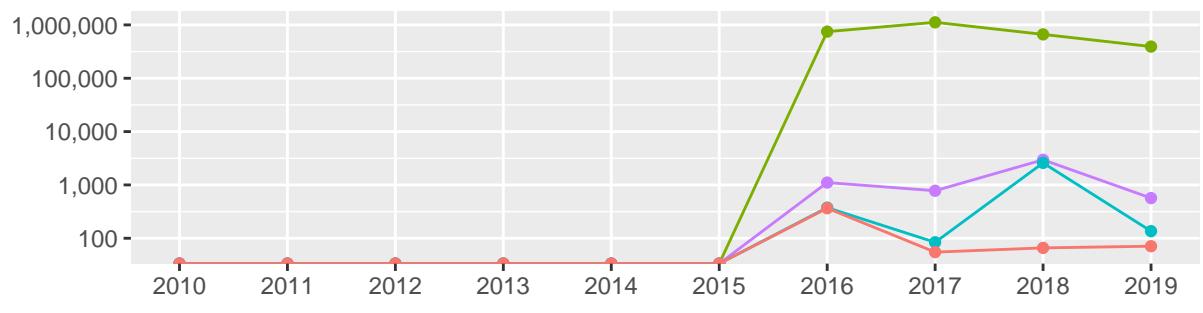
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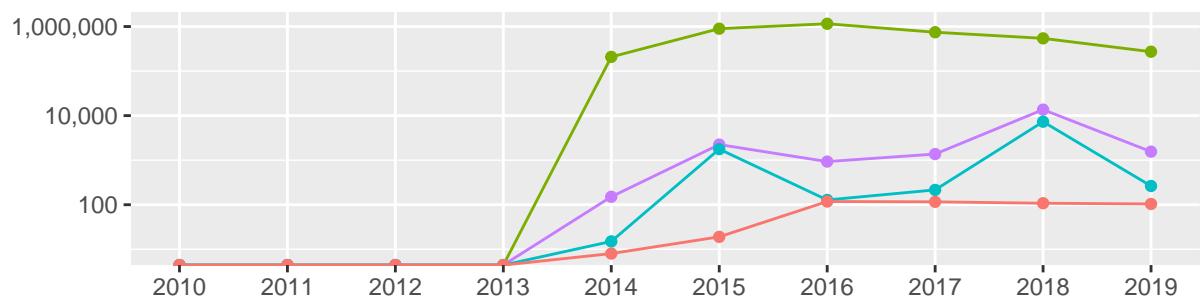
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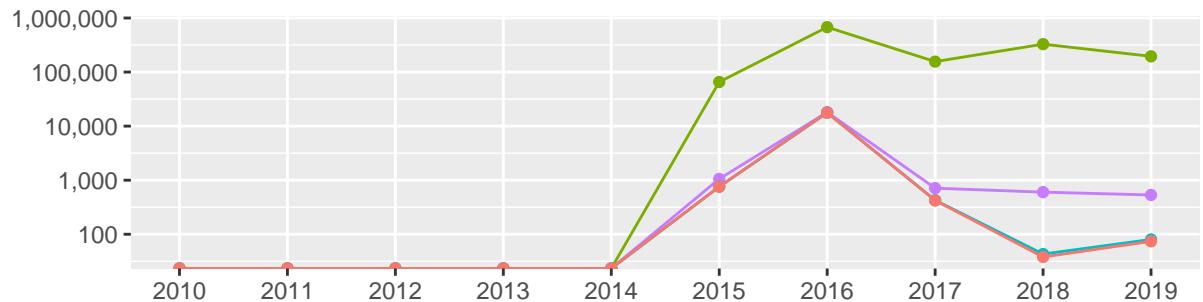
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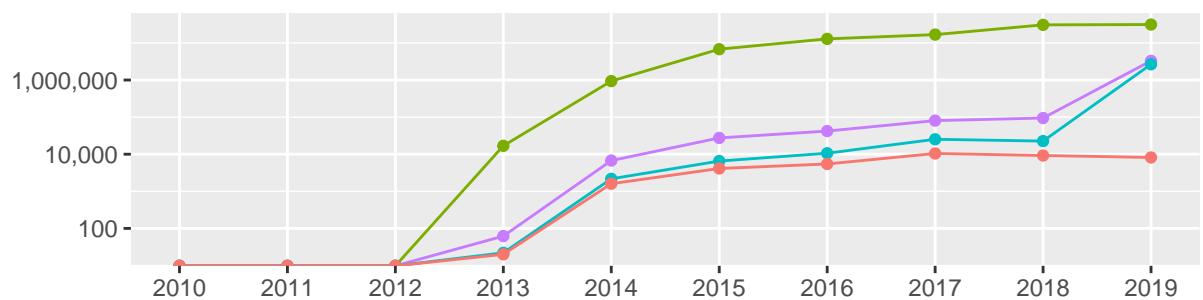
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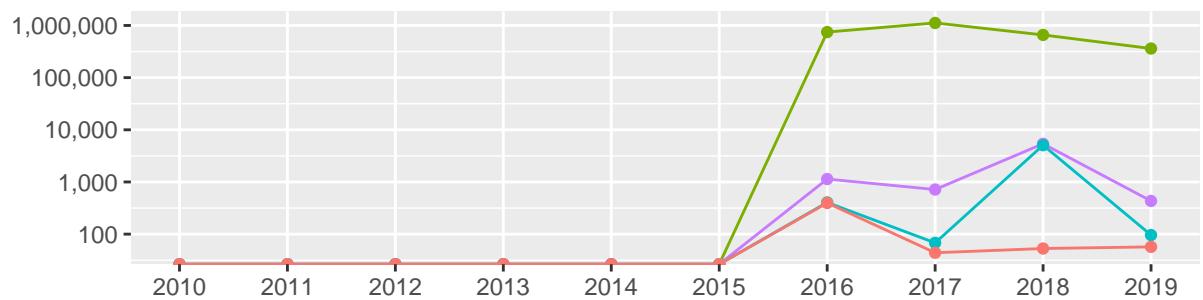
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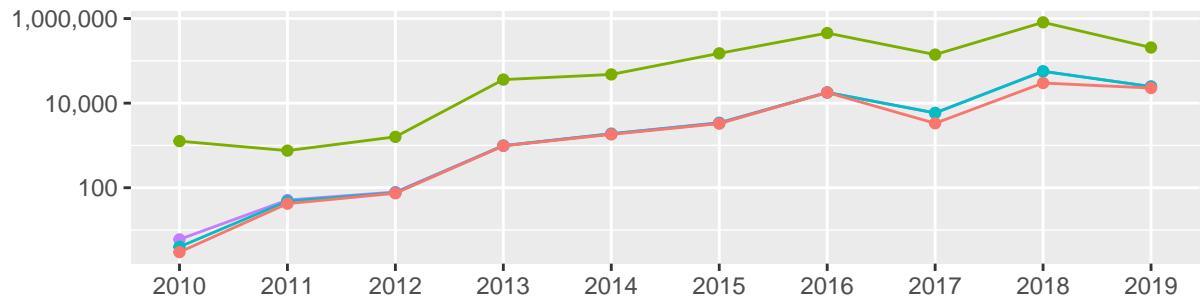
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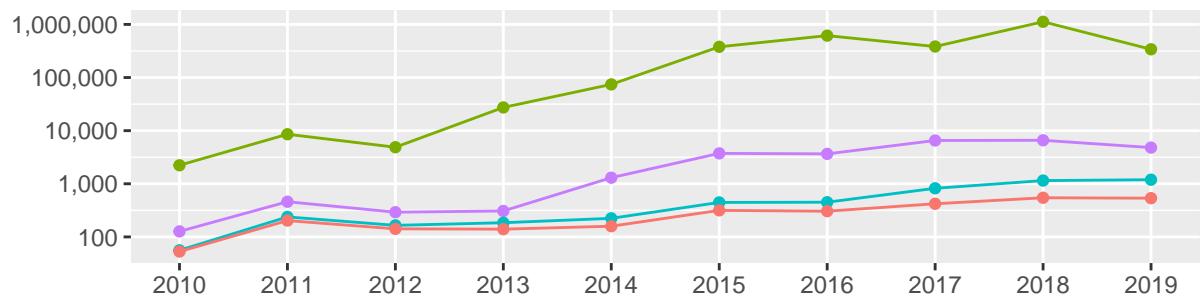
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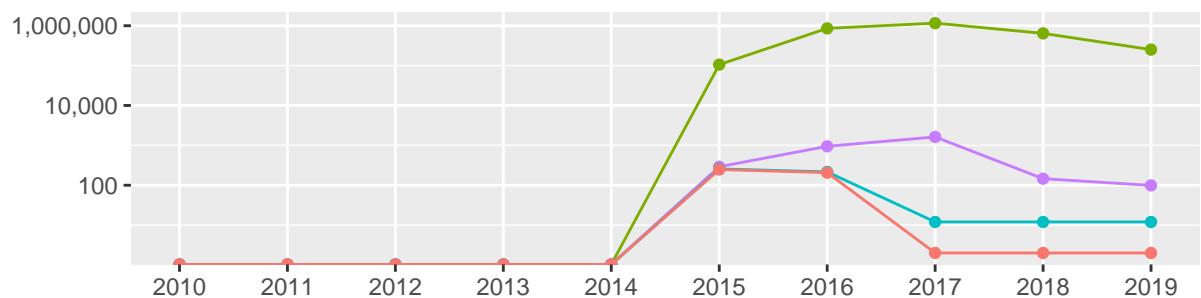
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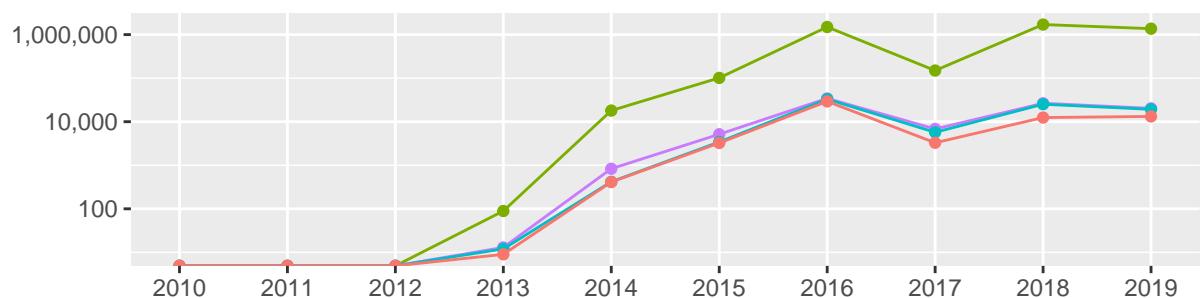
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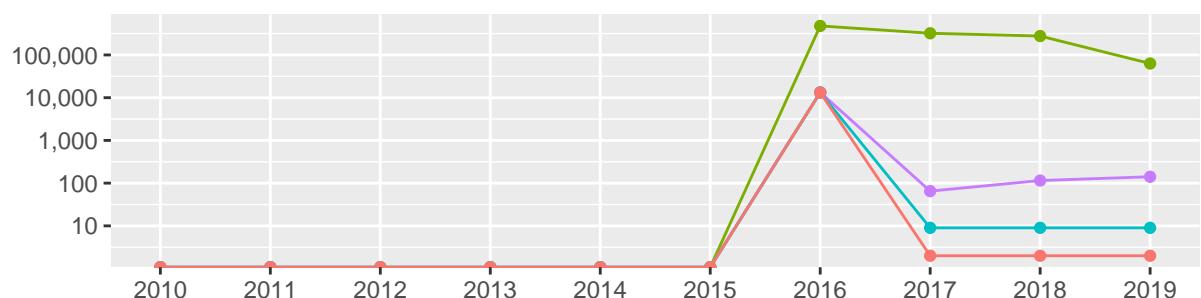
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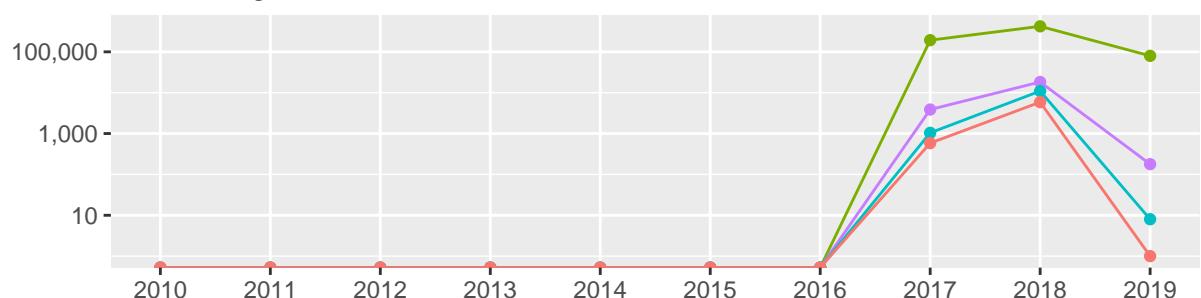
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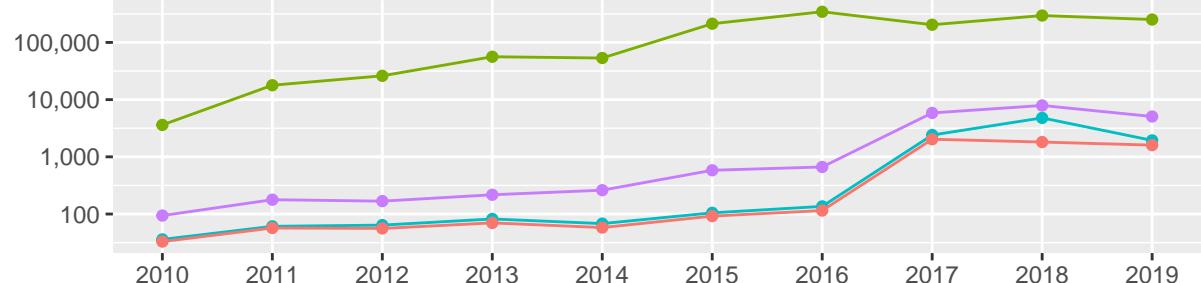
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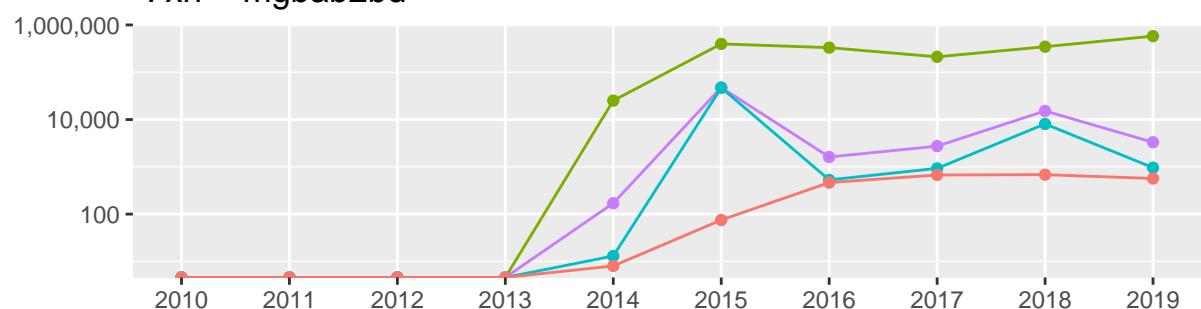
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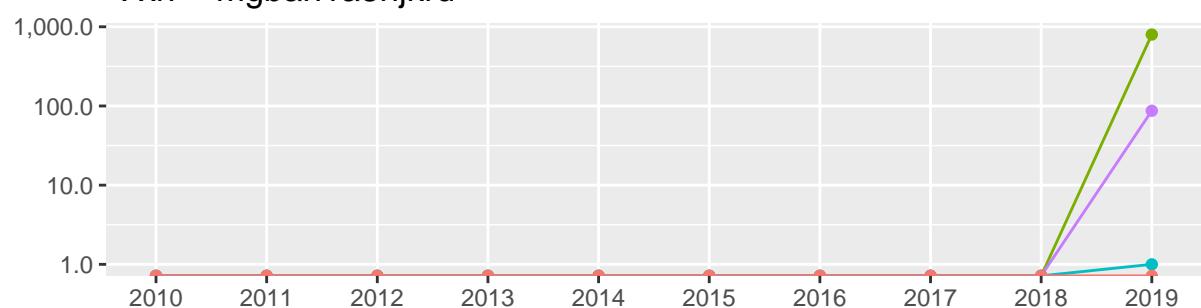
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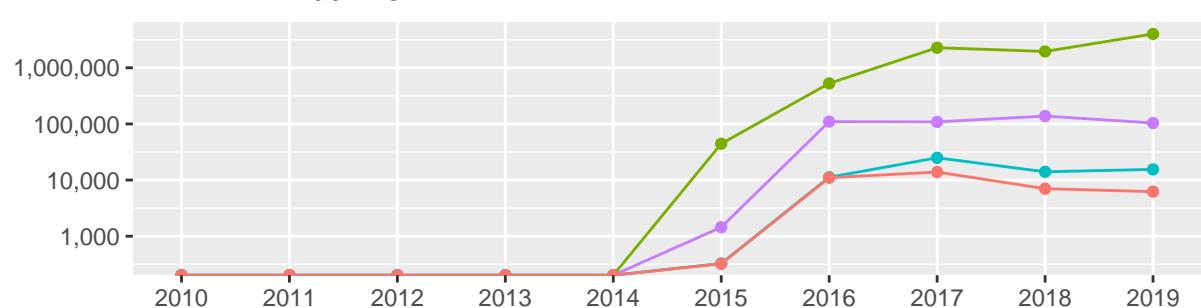
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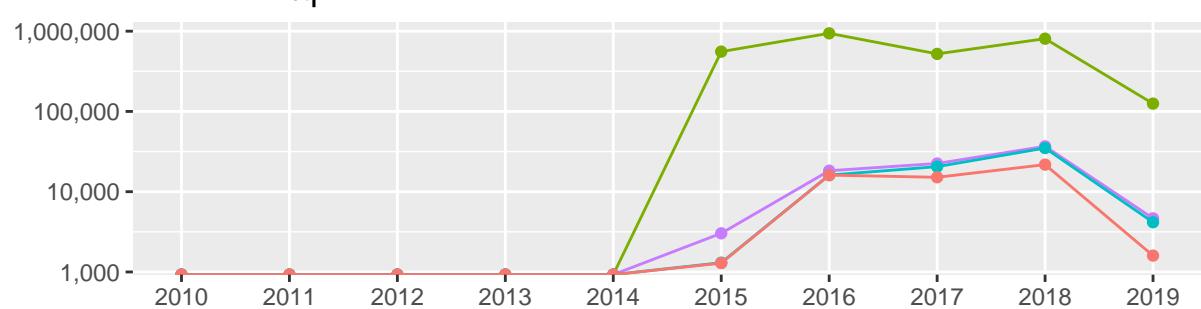
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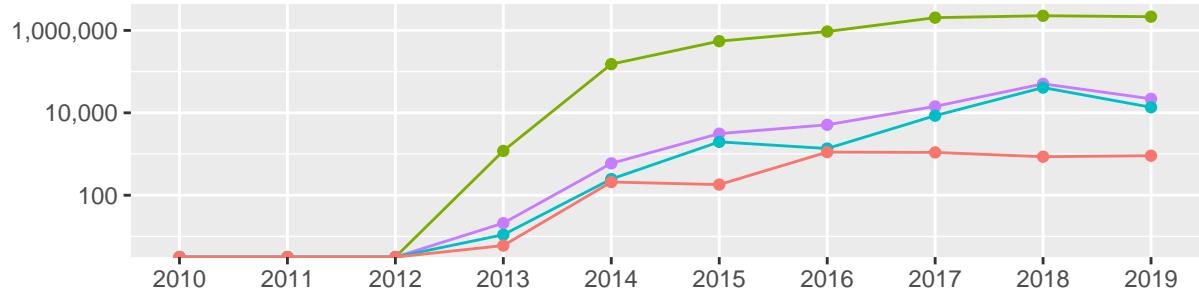
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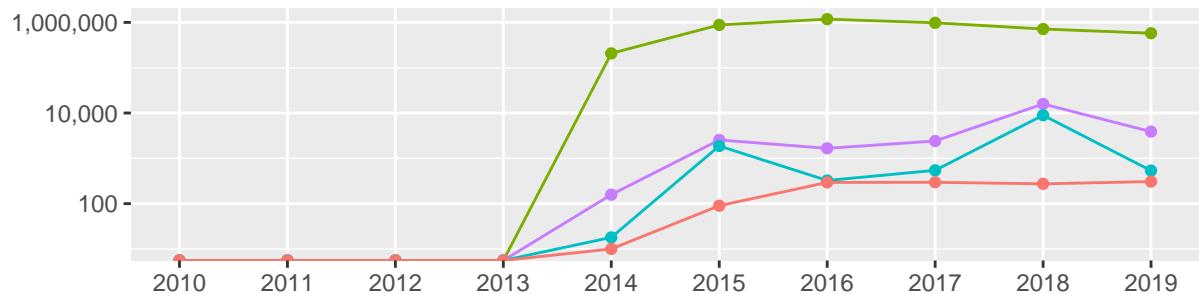
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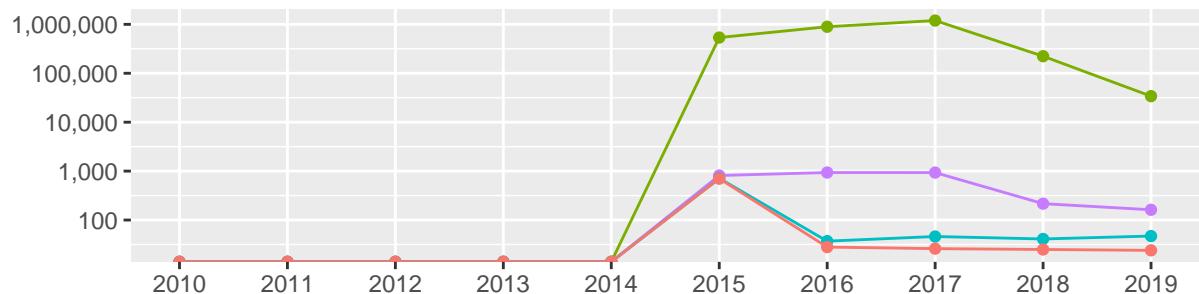
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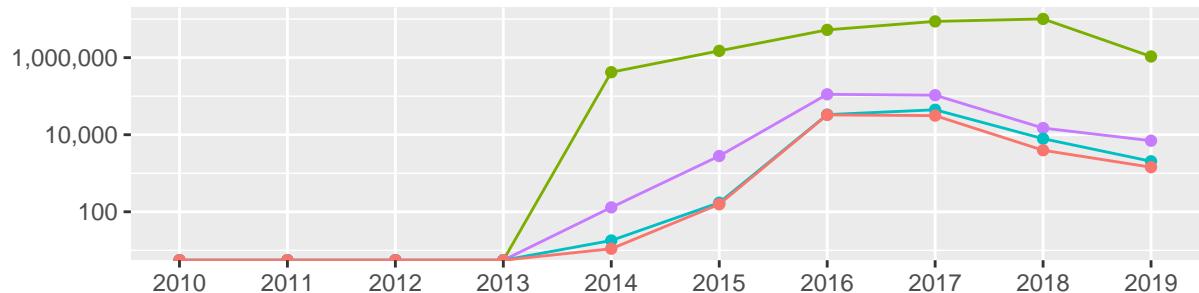
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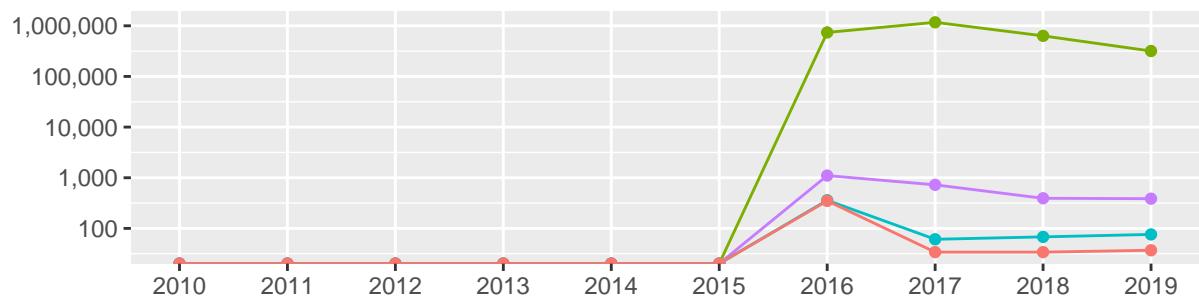
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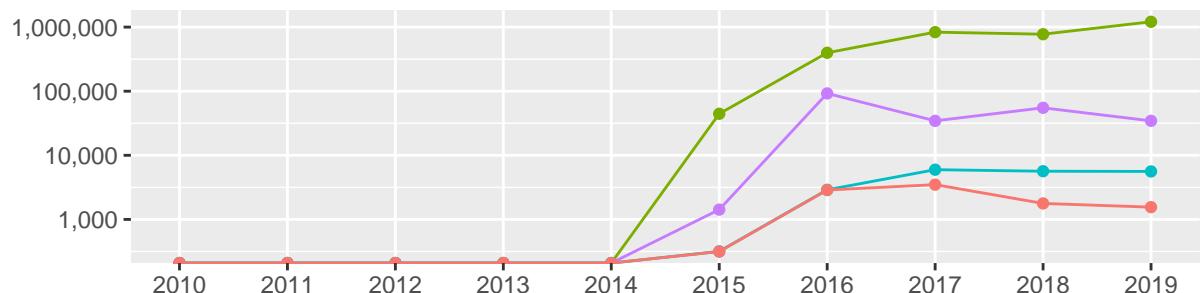
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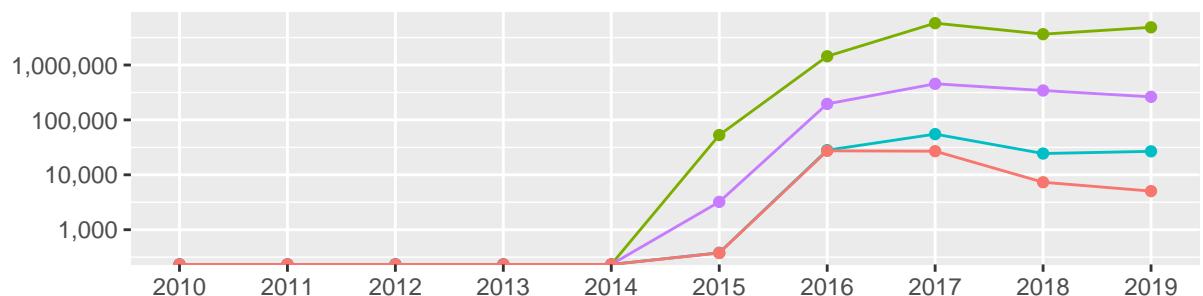
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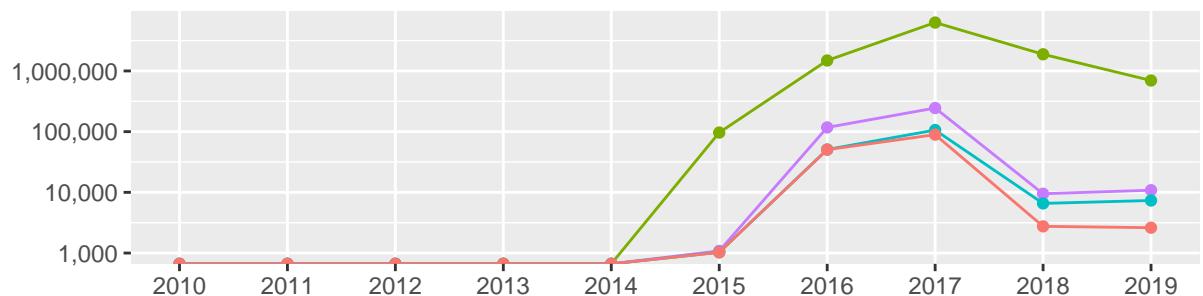
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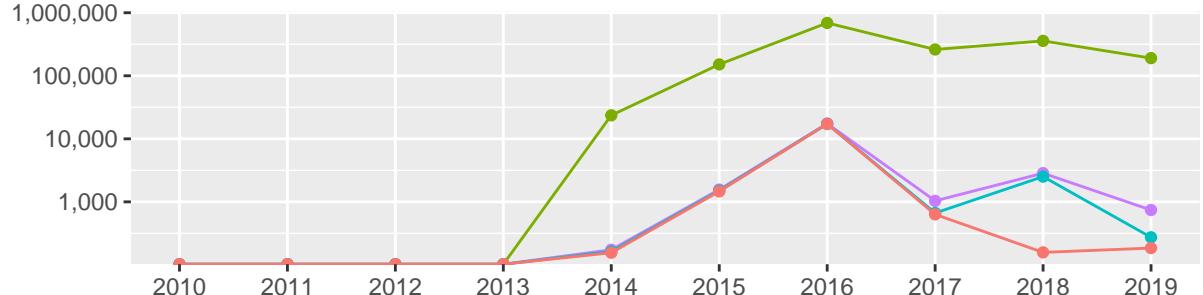
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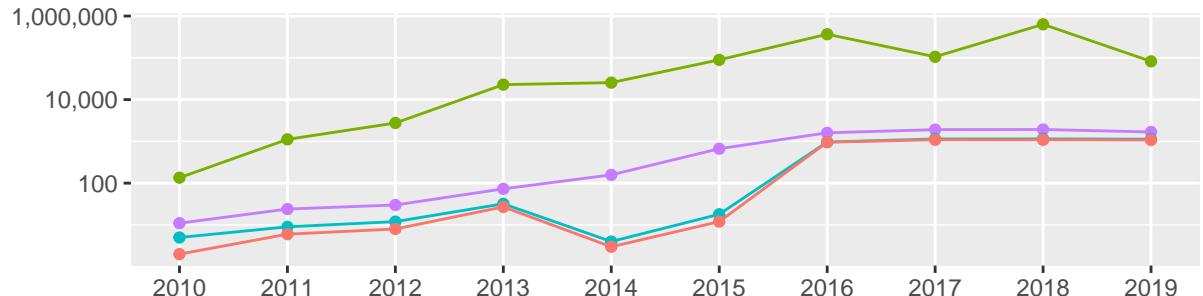
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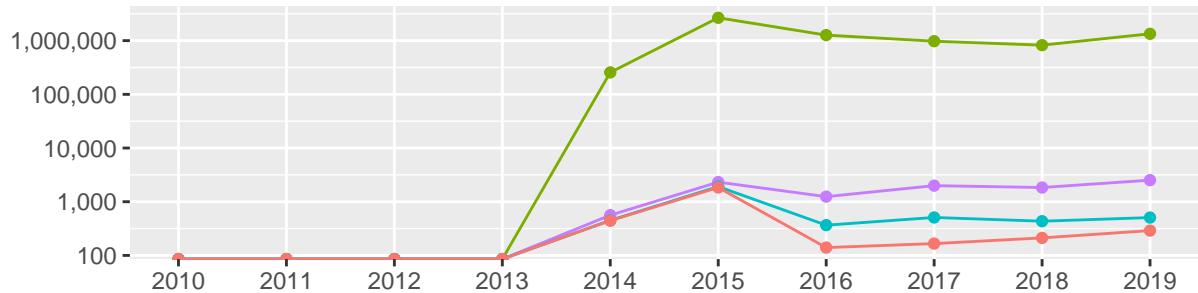
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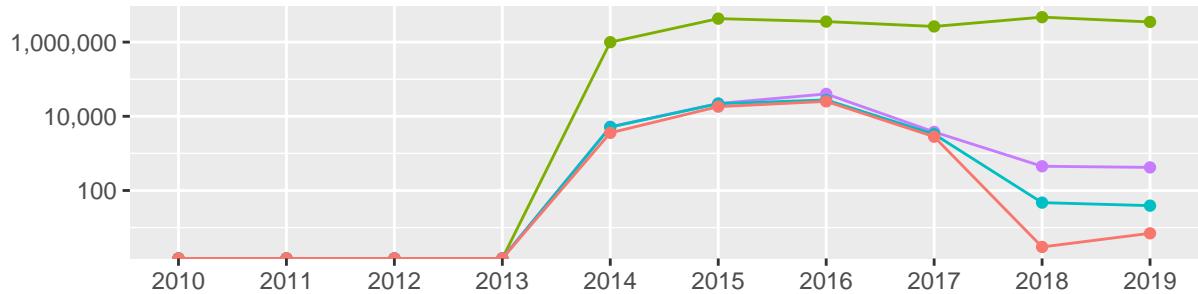
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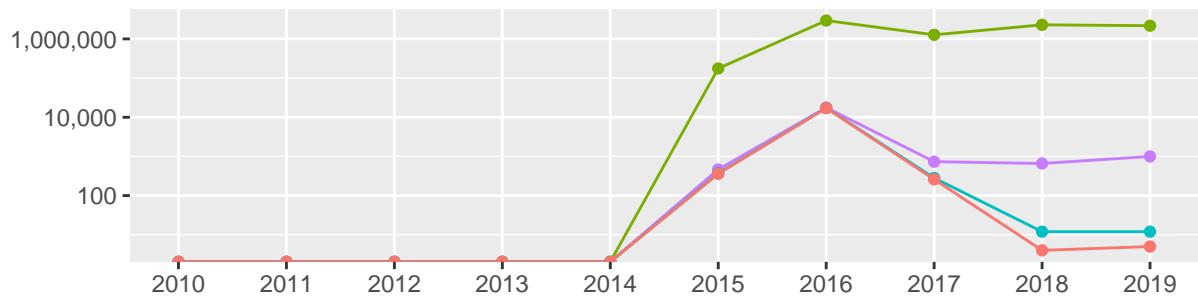
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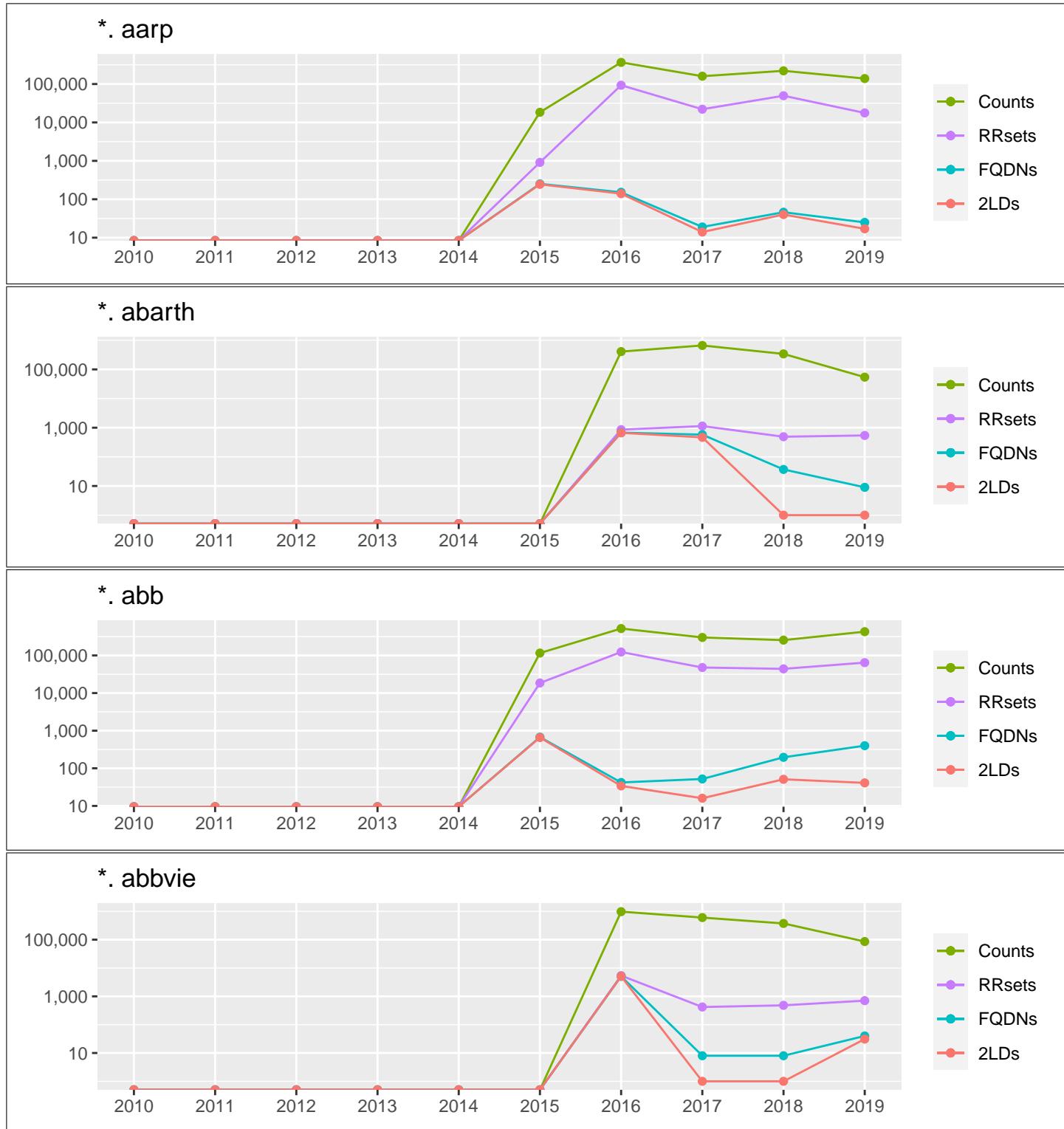


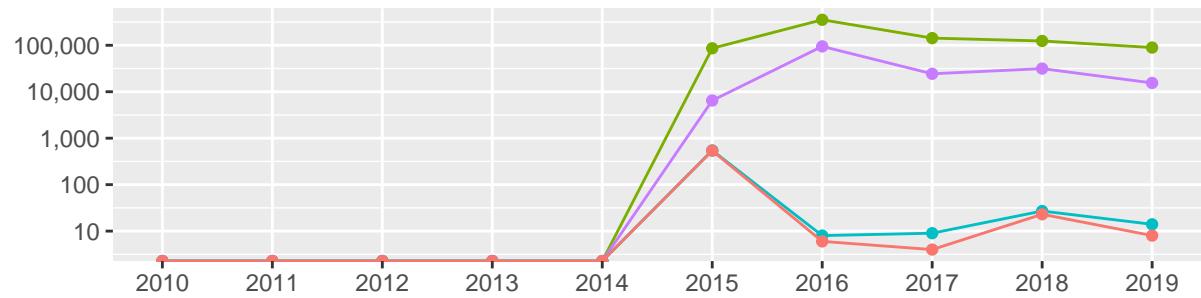
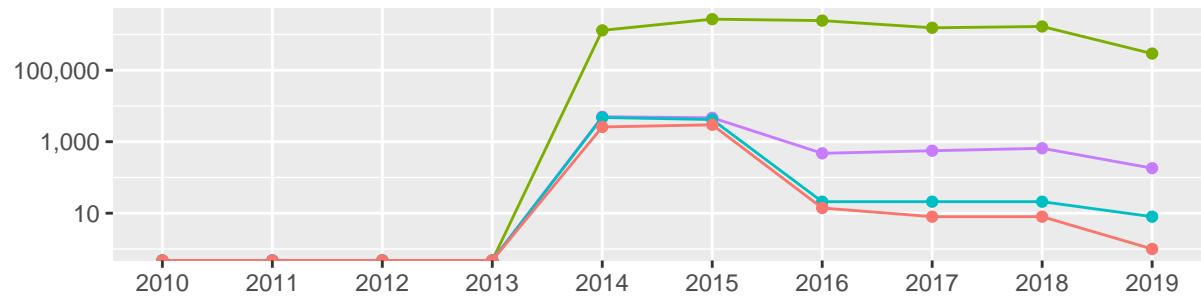
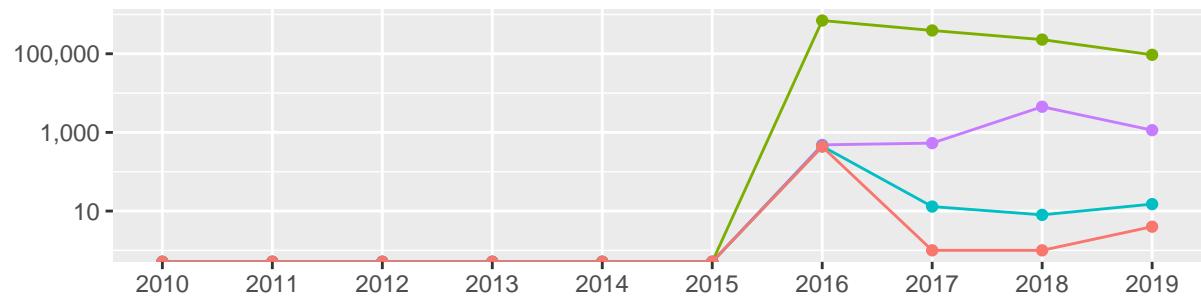
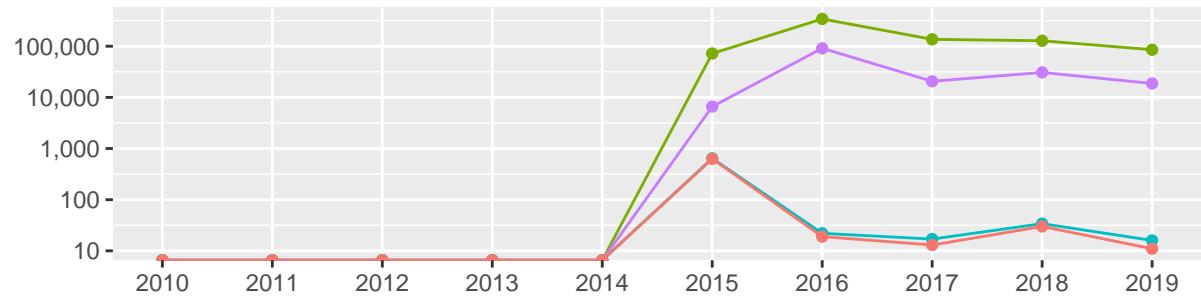
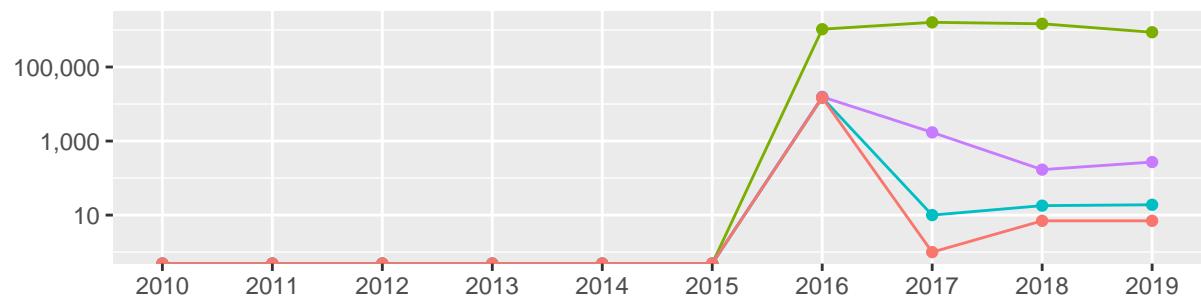
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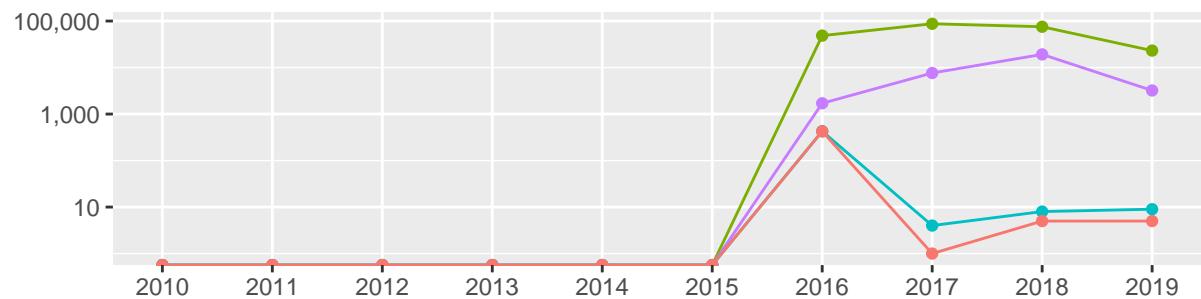
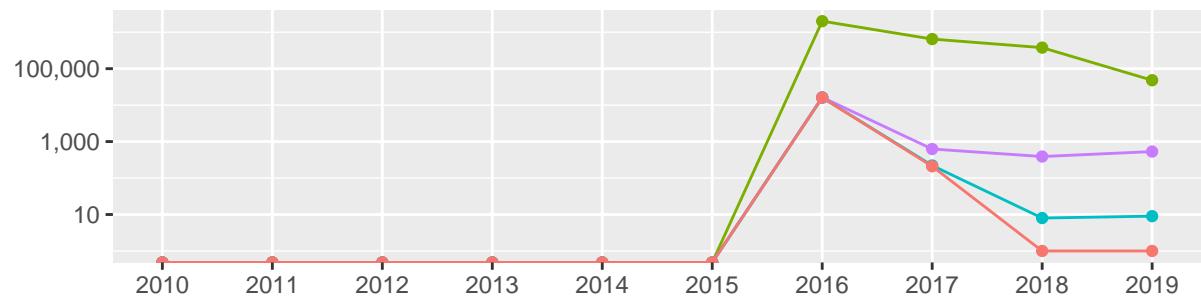
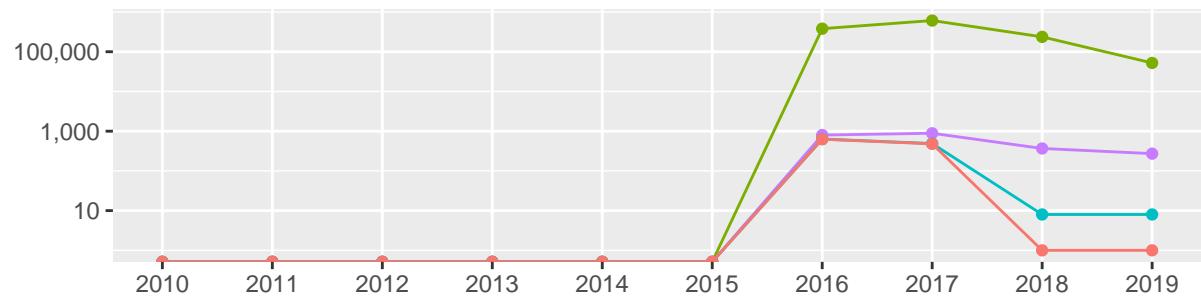
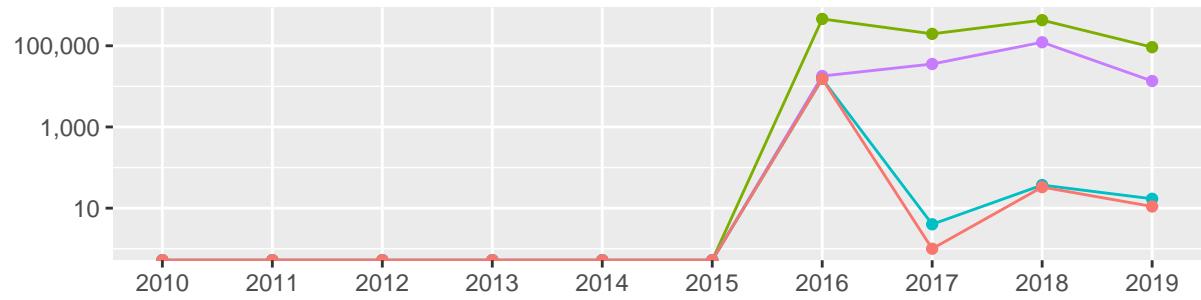
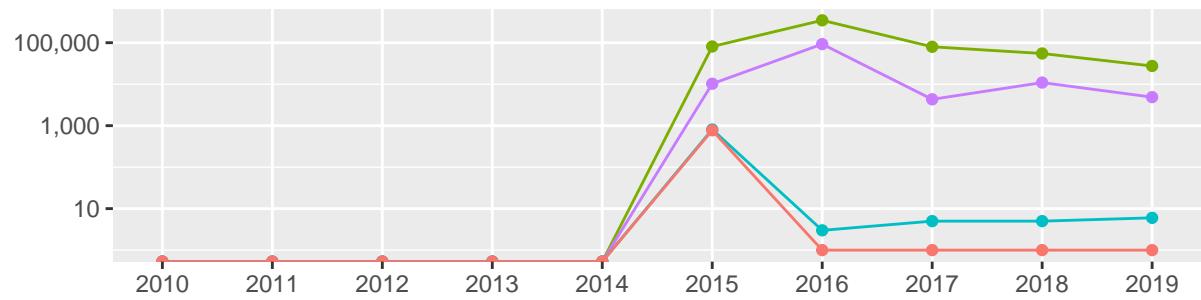


Chapter 9

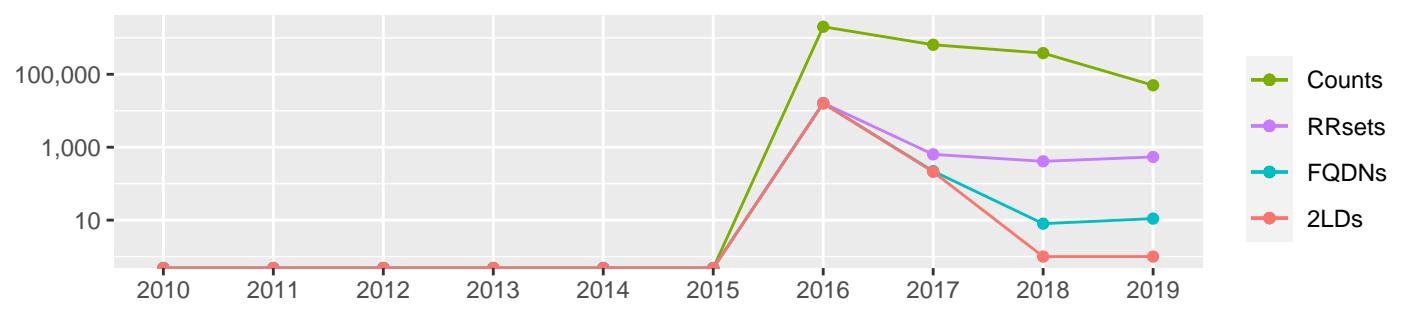
Hundreds of Thousands or Less



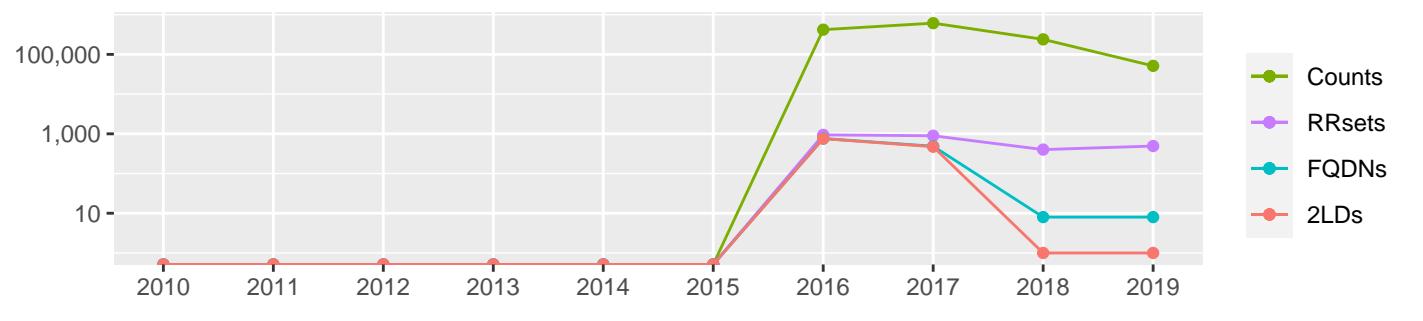
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. afamilycompany**. agakhan*****. aigo*****. airbus*****. airtel**

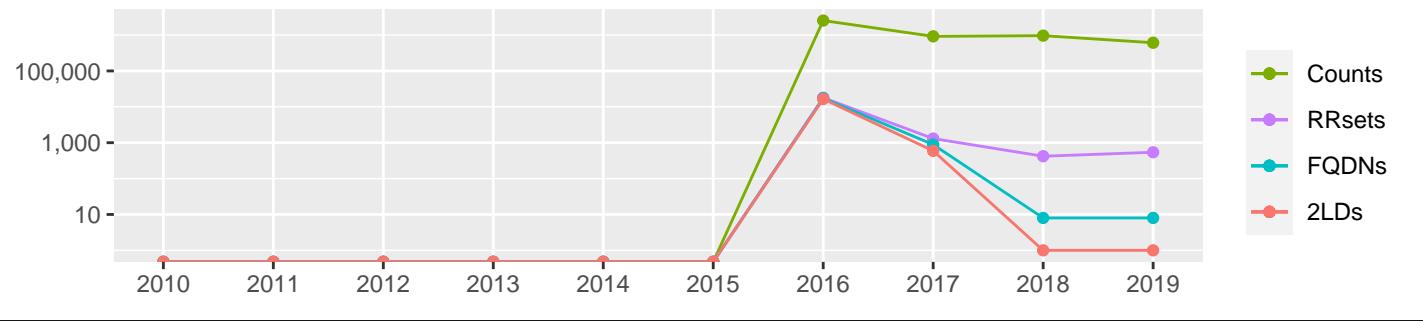
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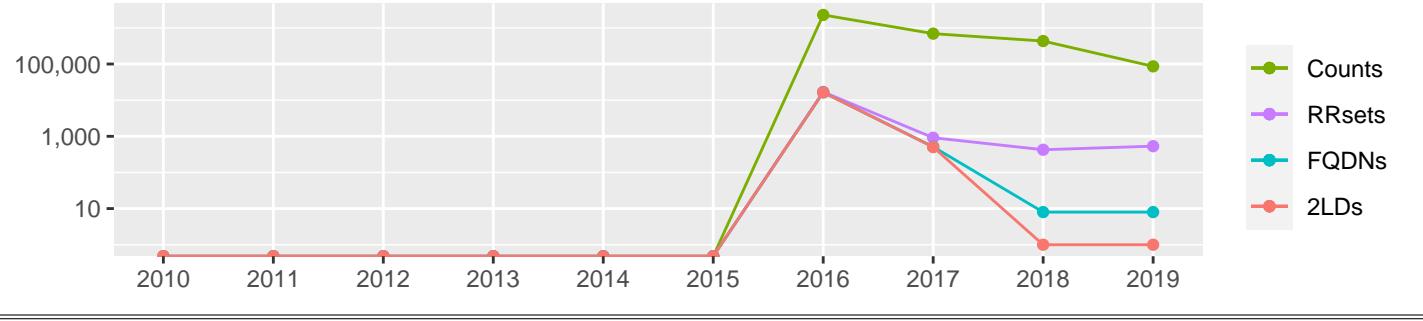
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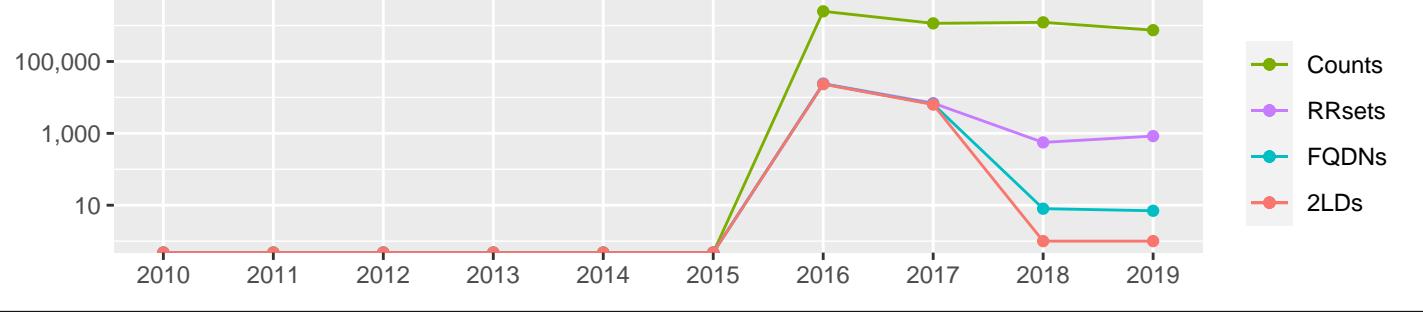
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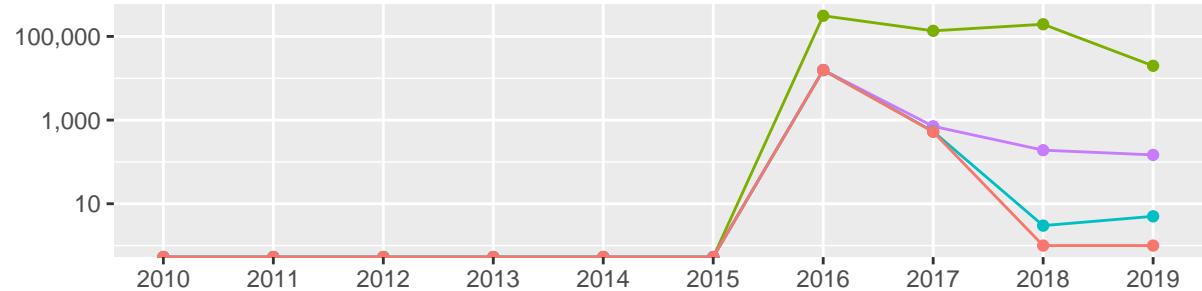
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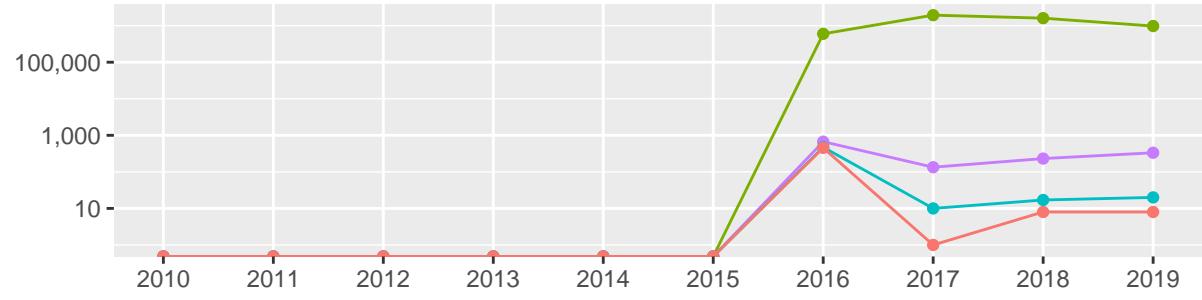
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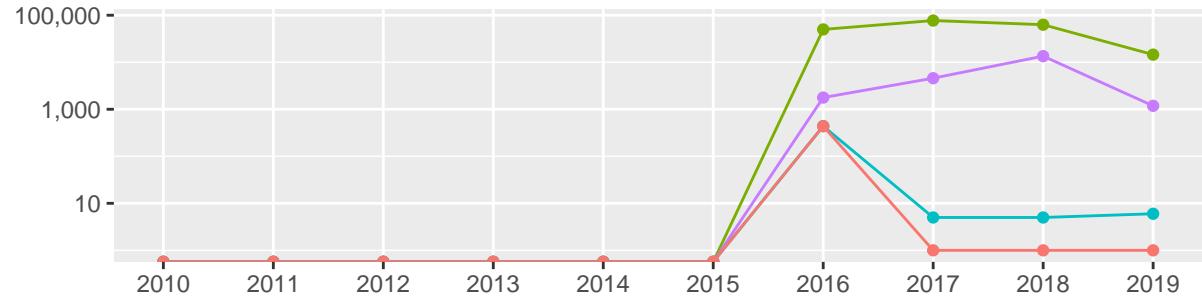
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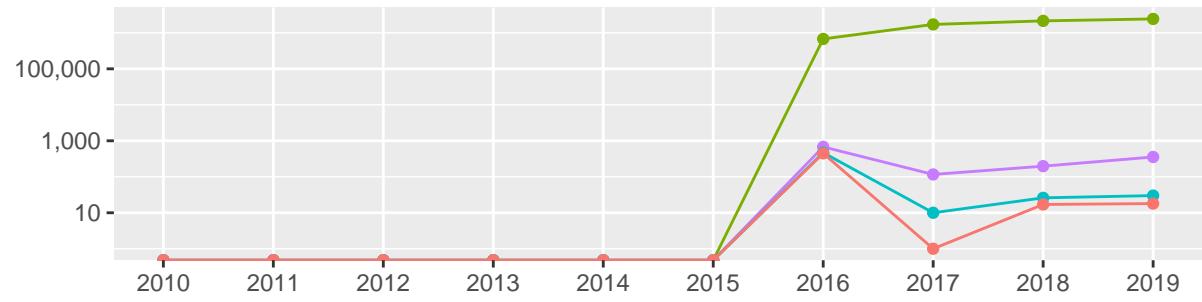
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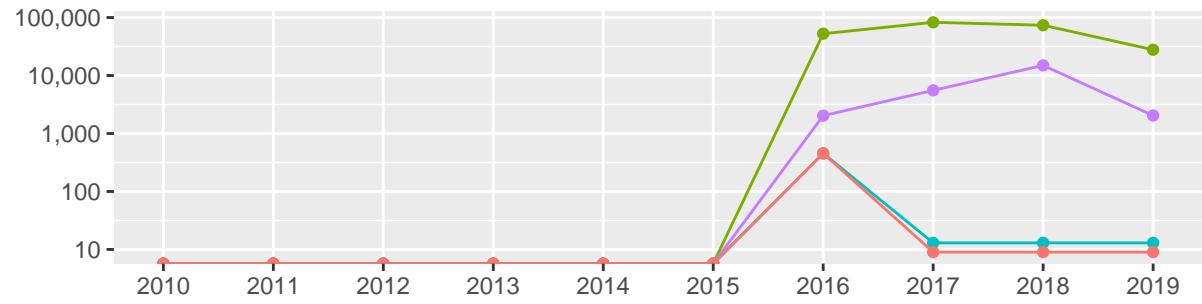
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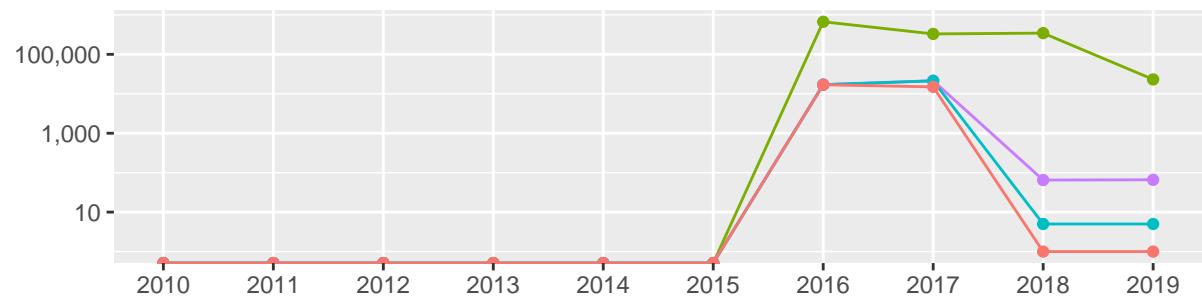
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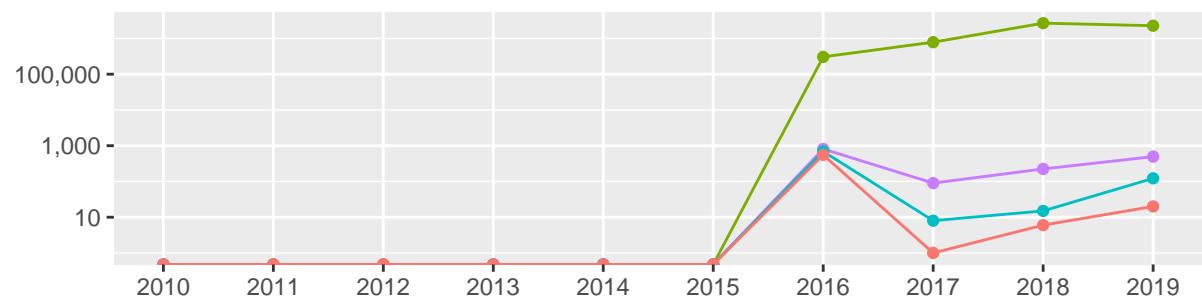
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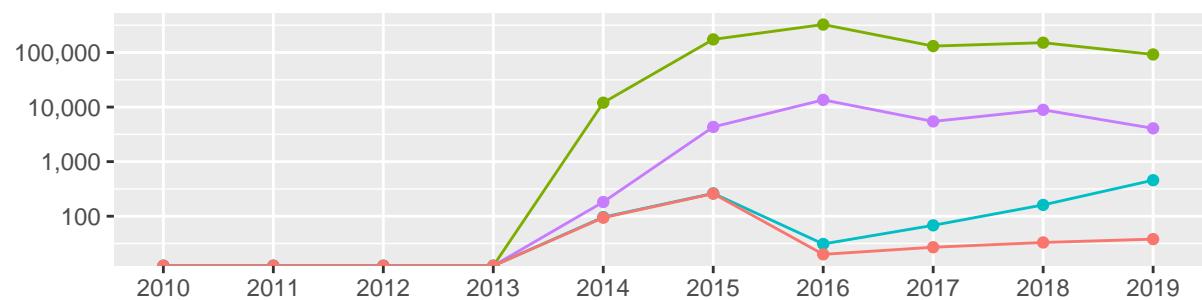
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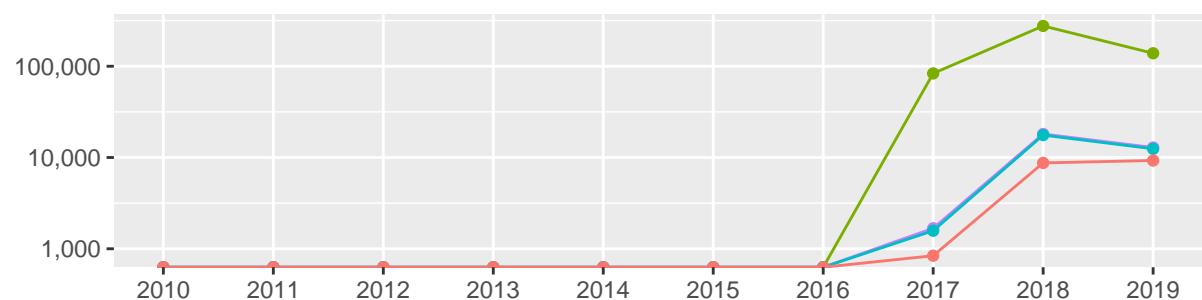
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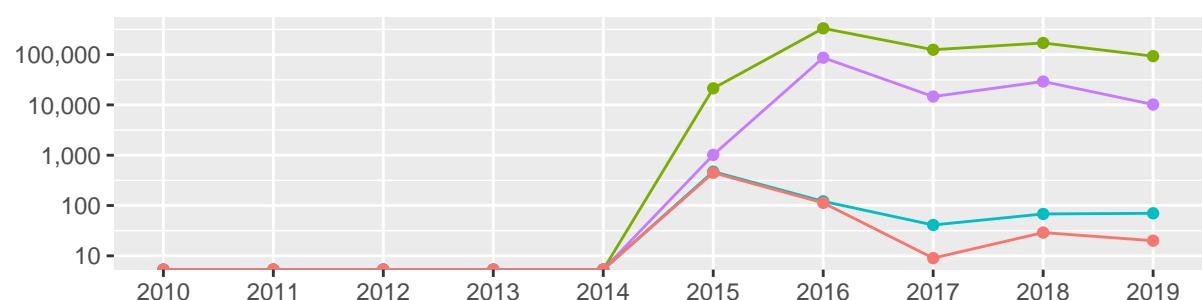
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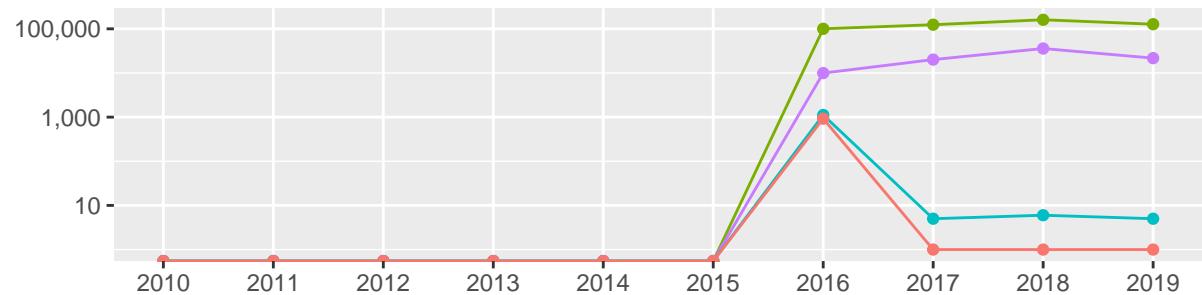
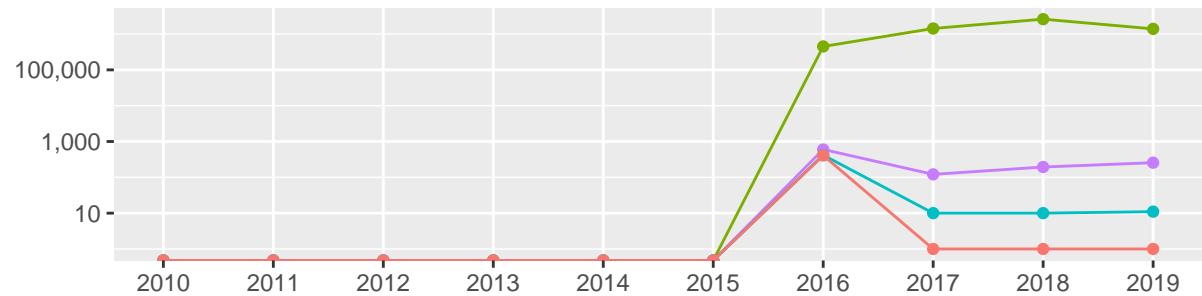
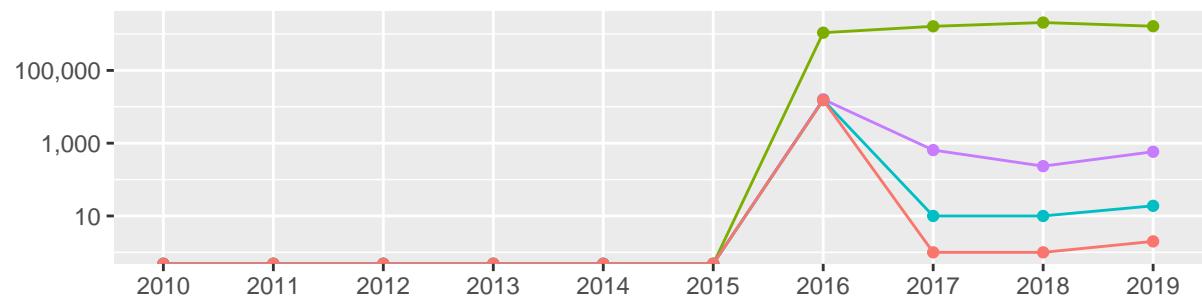
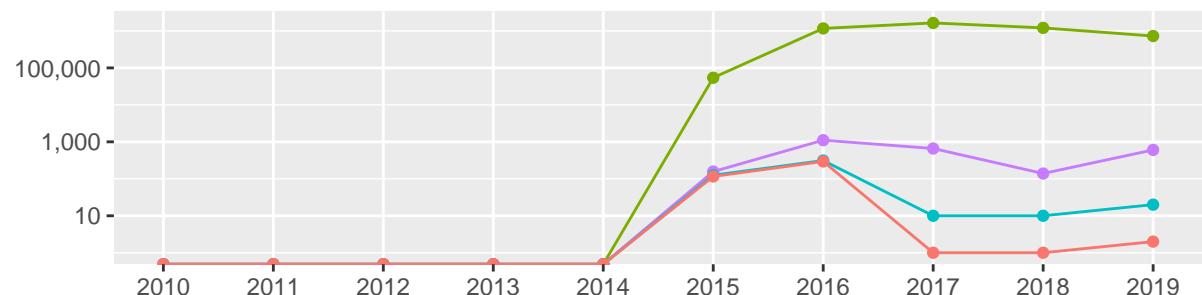
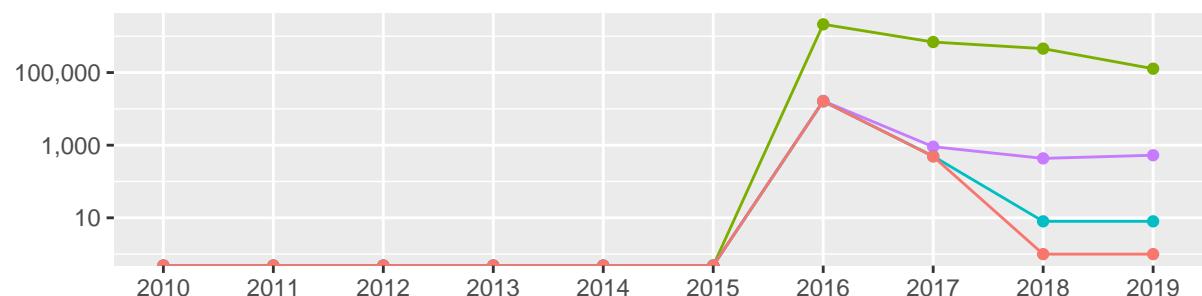


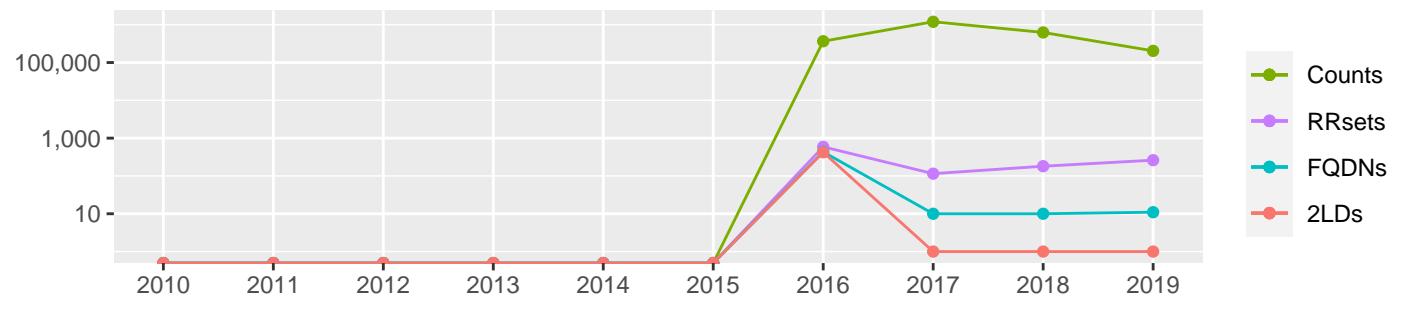
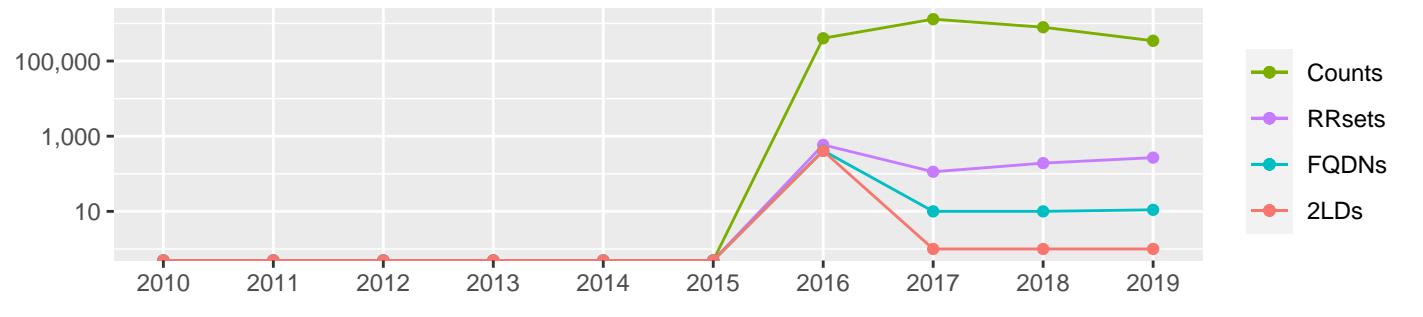
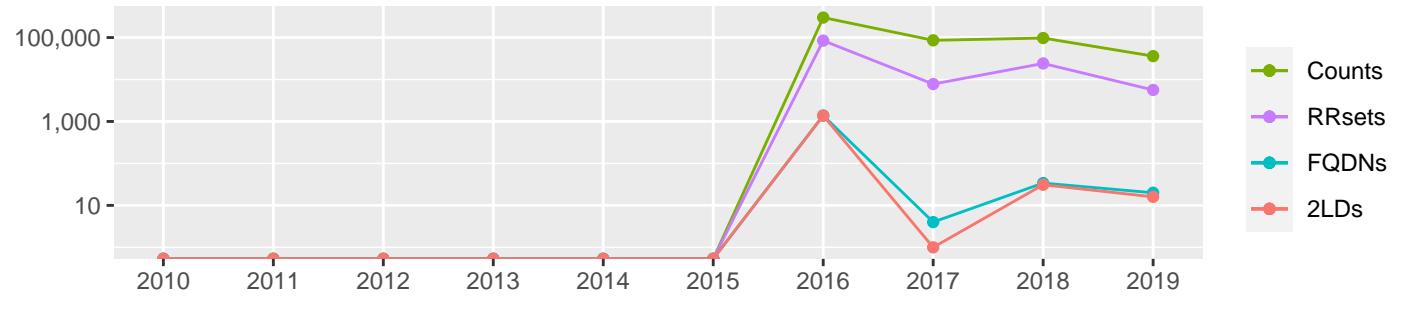
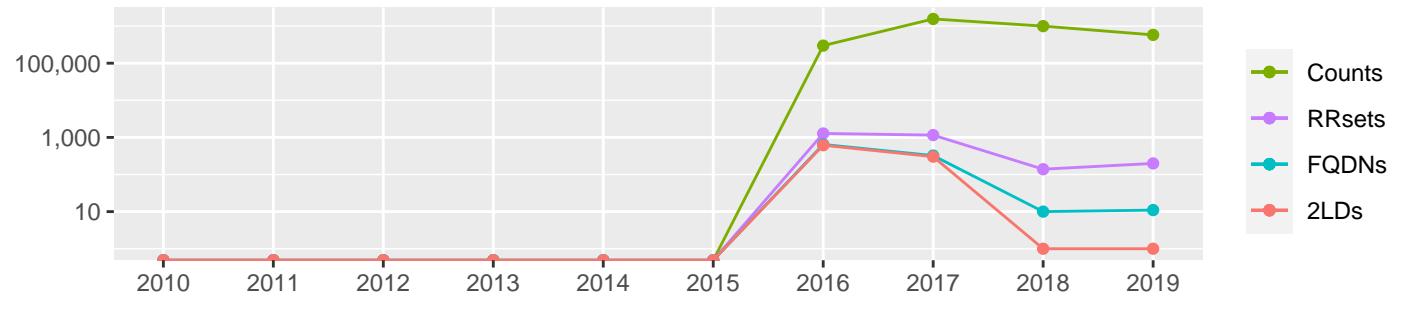
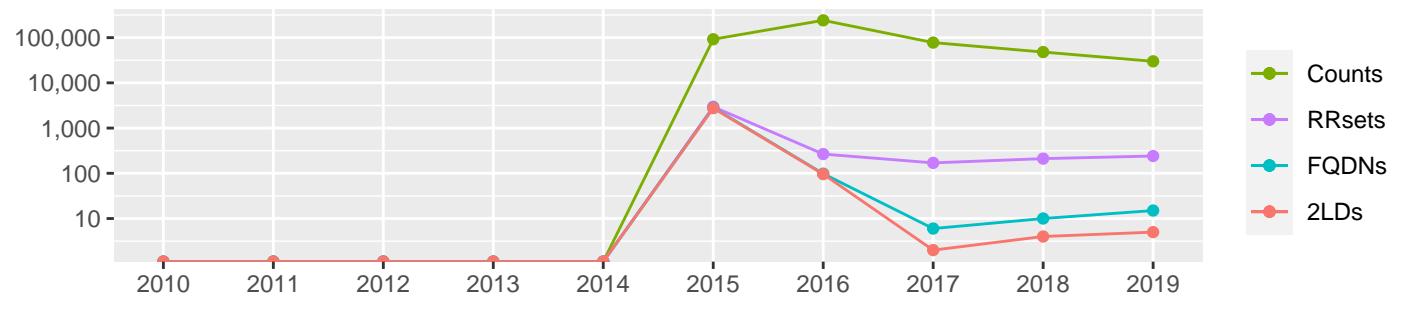
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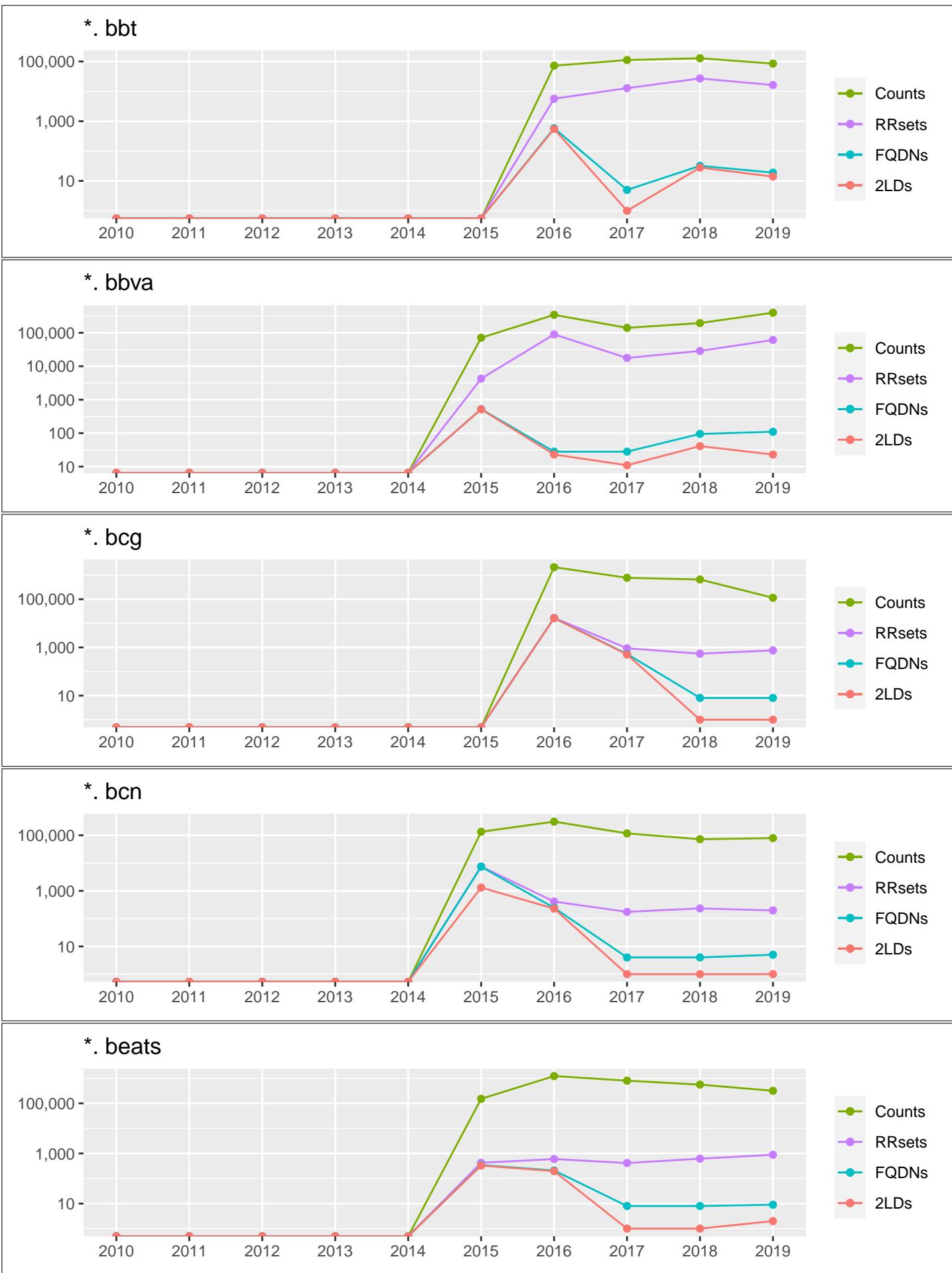


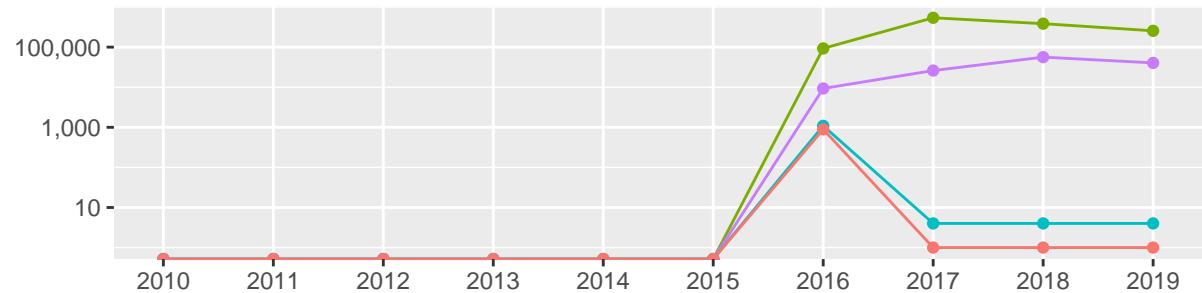
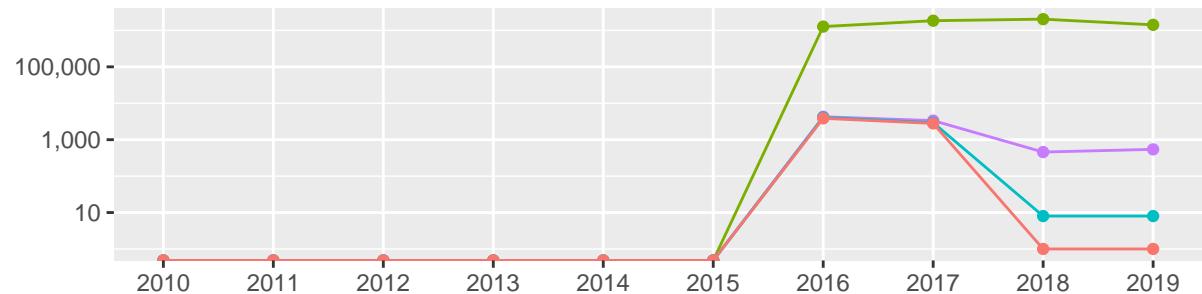
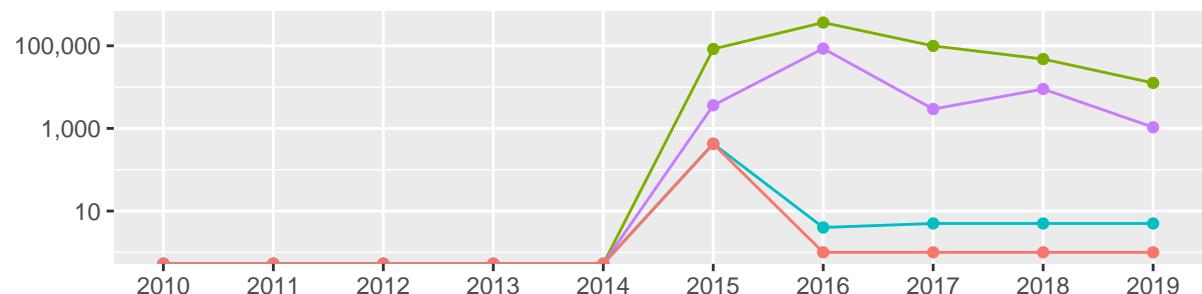
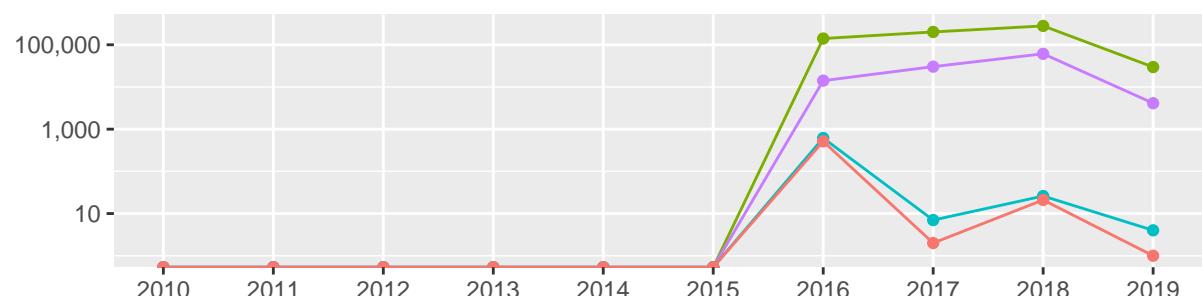
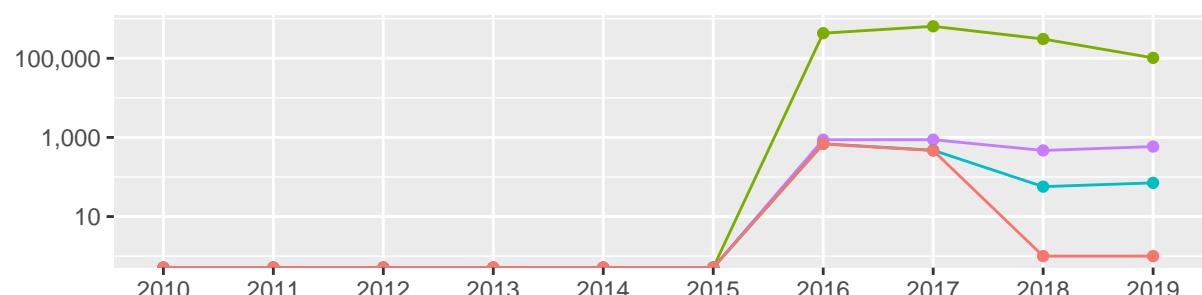
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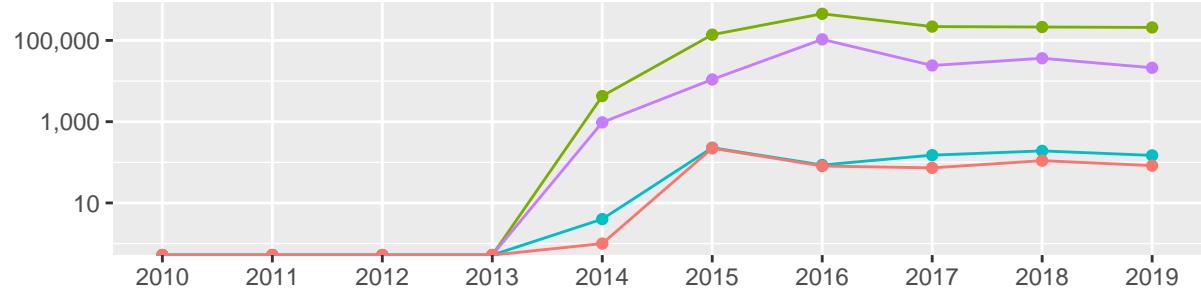
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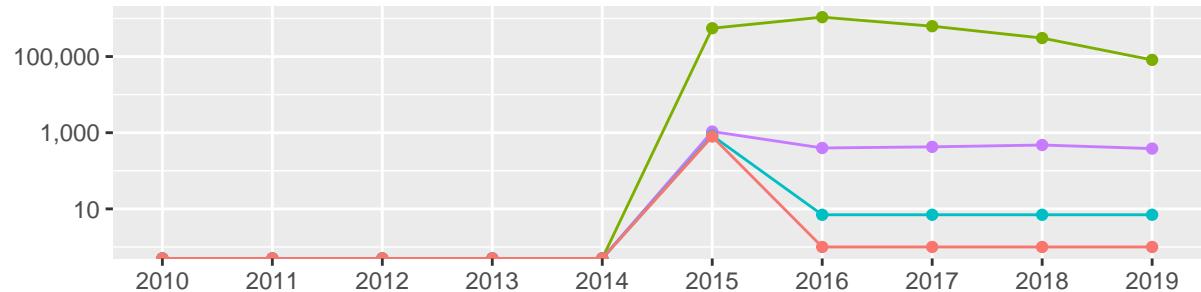


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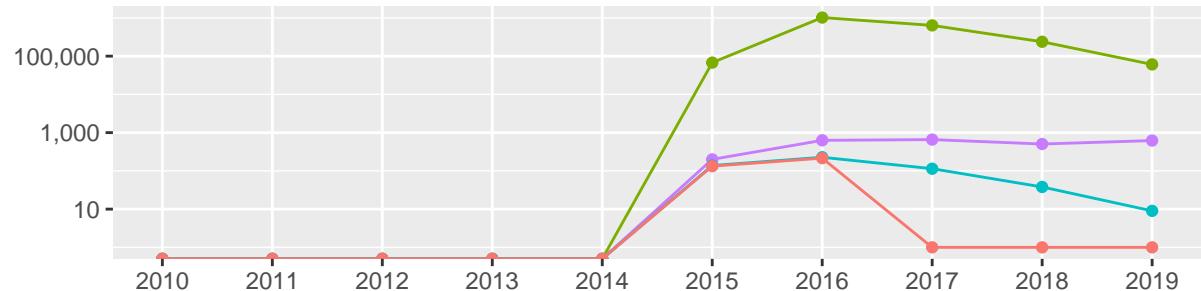
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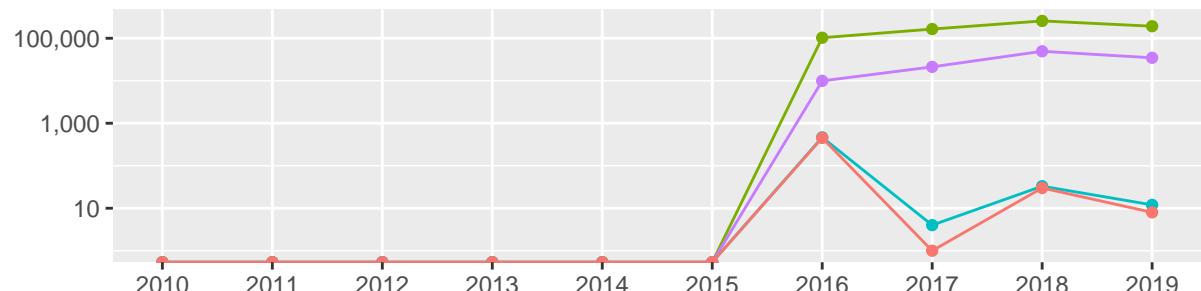
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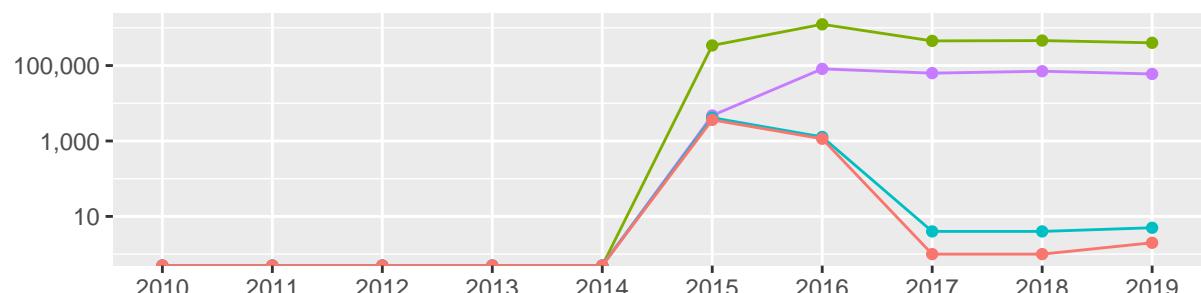
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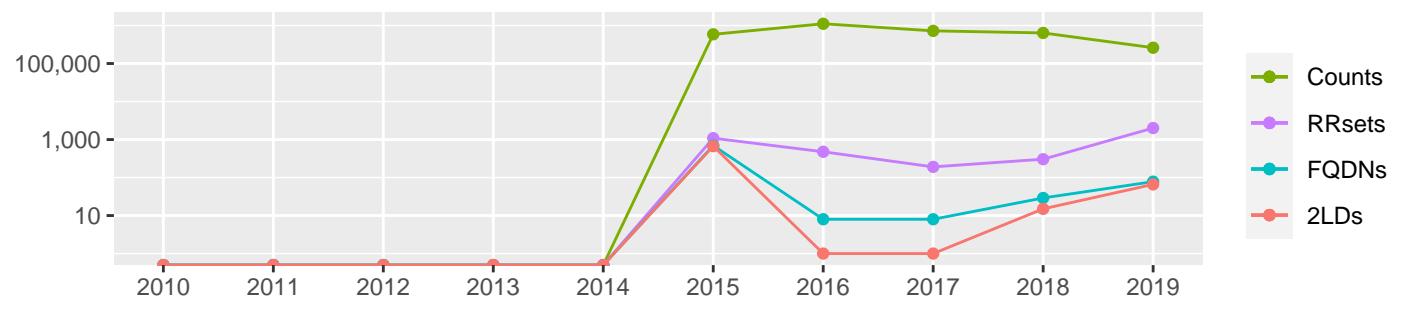
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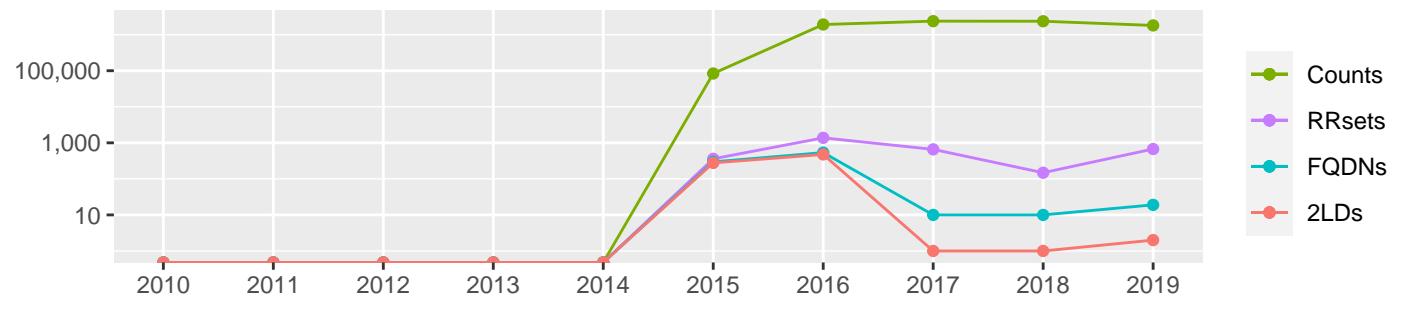
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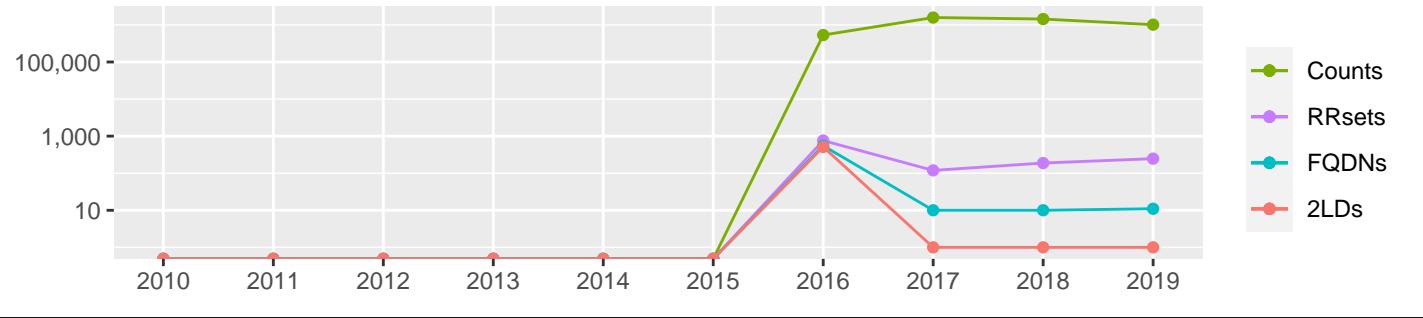
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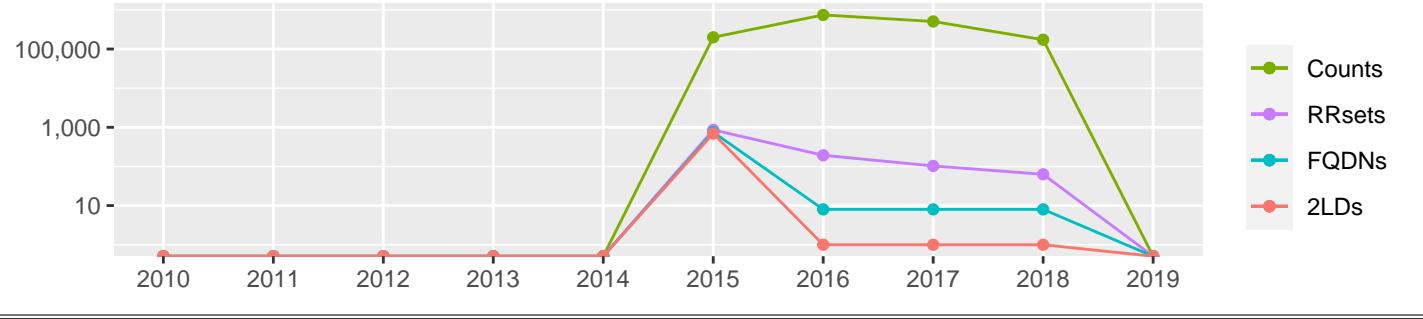
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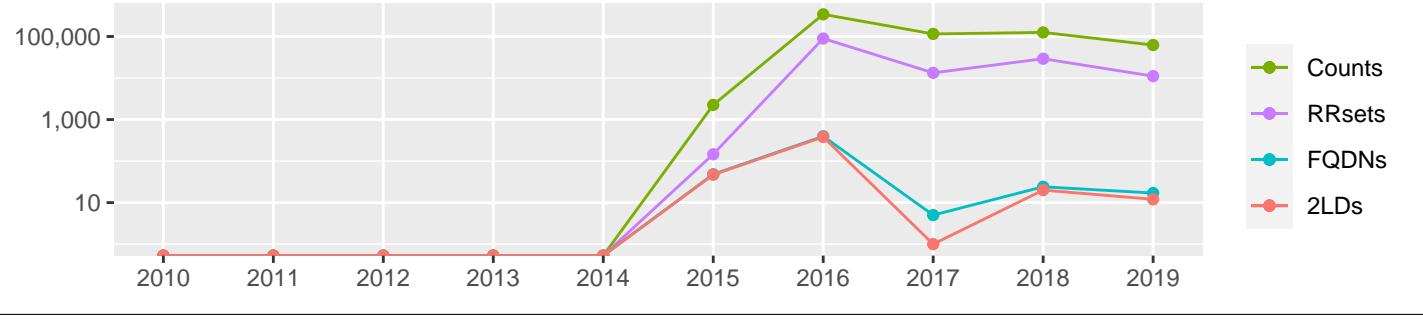
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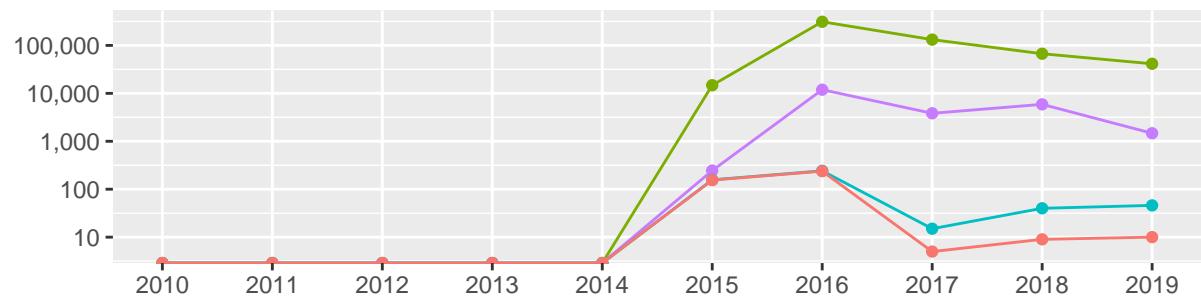
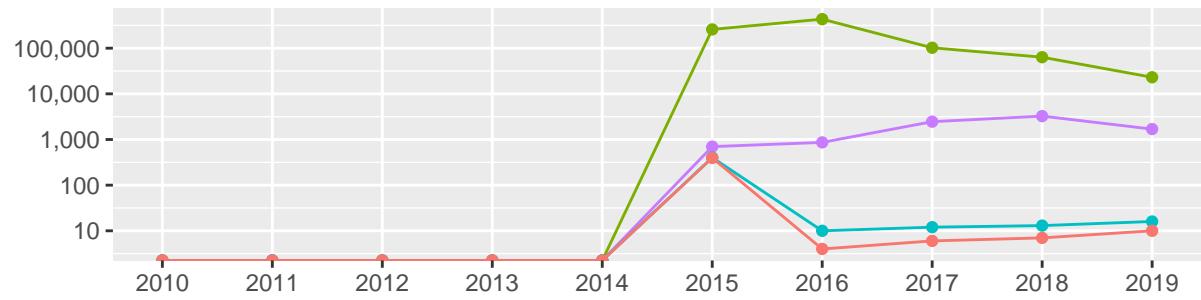
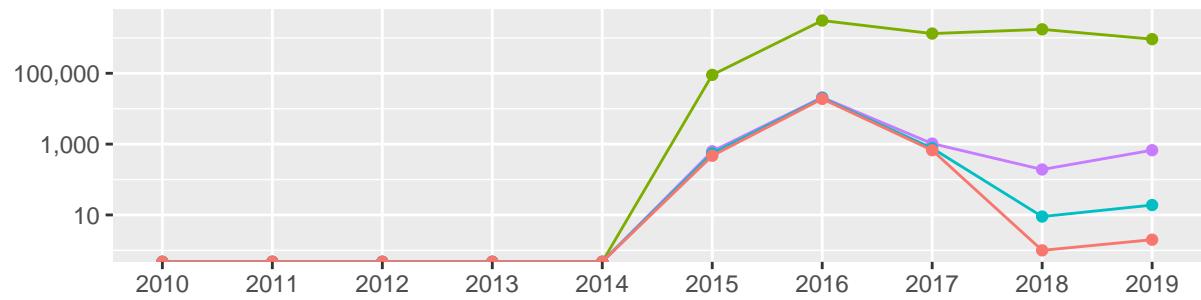
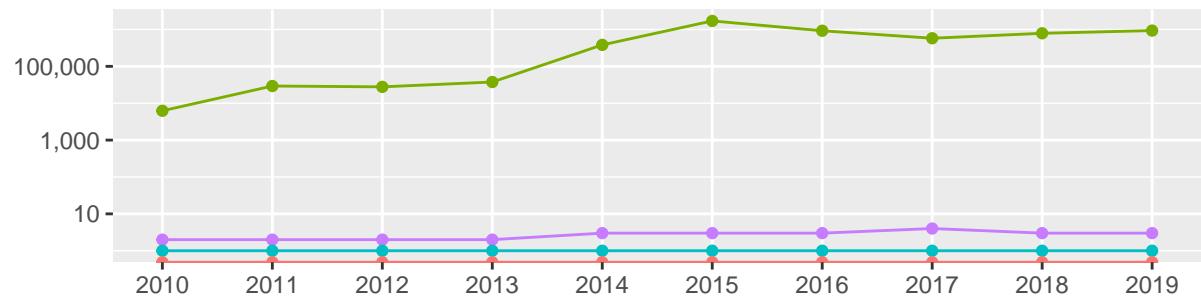
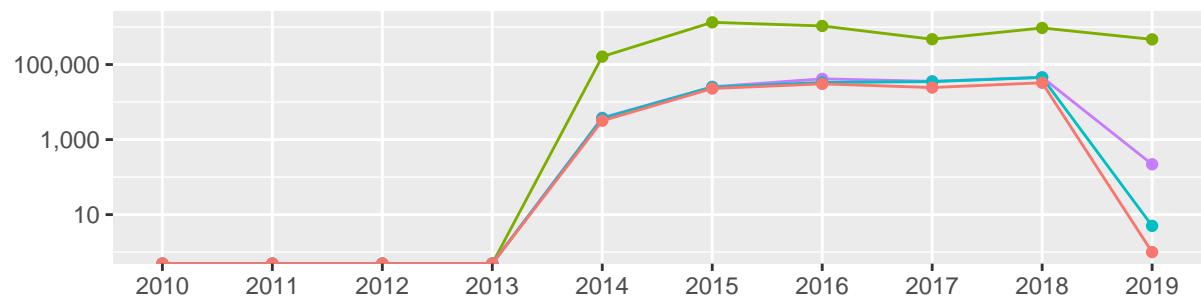


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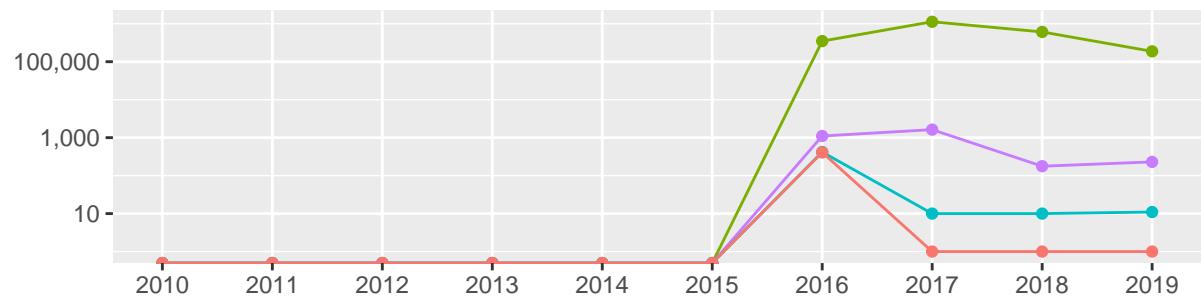


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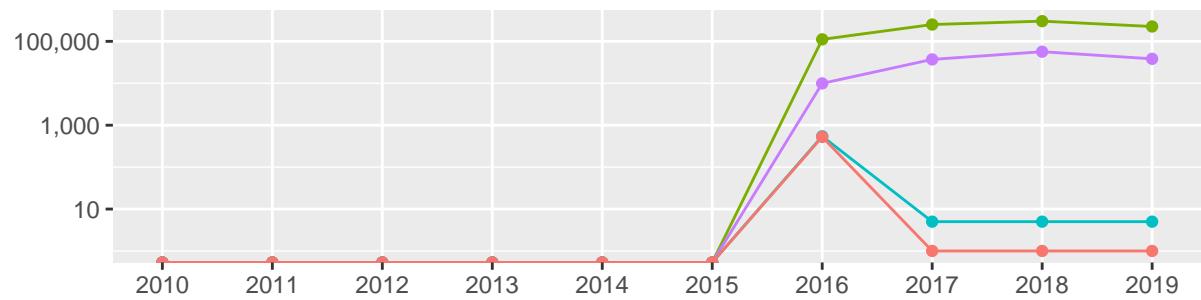


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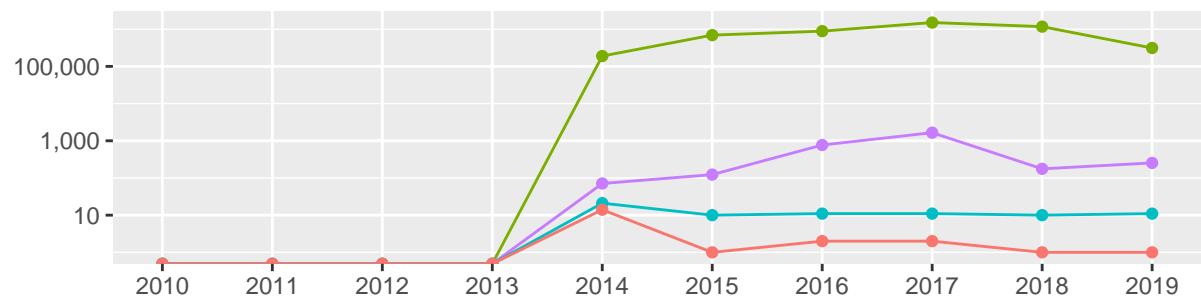
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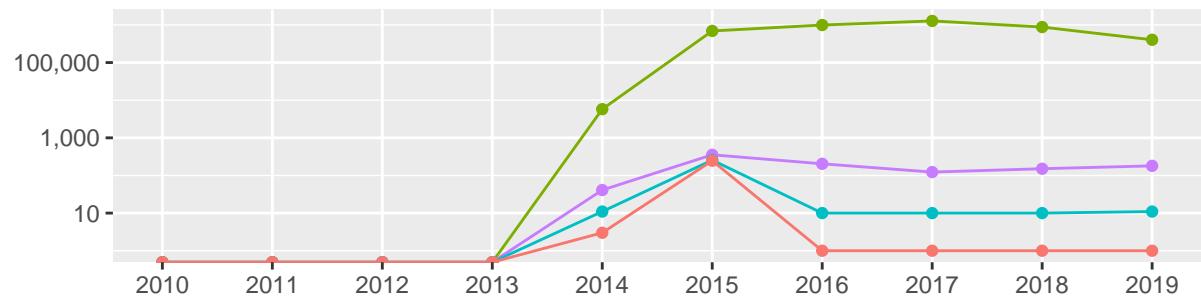
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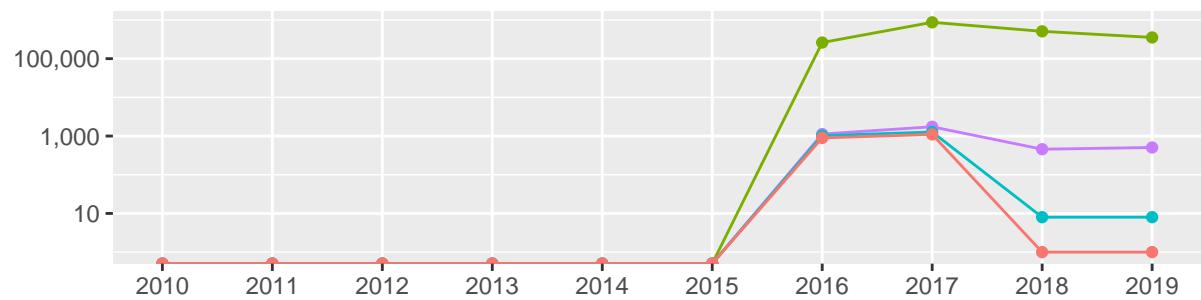
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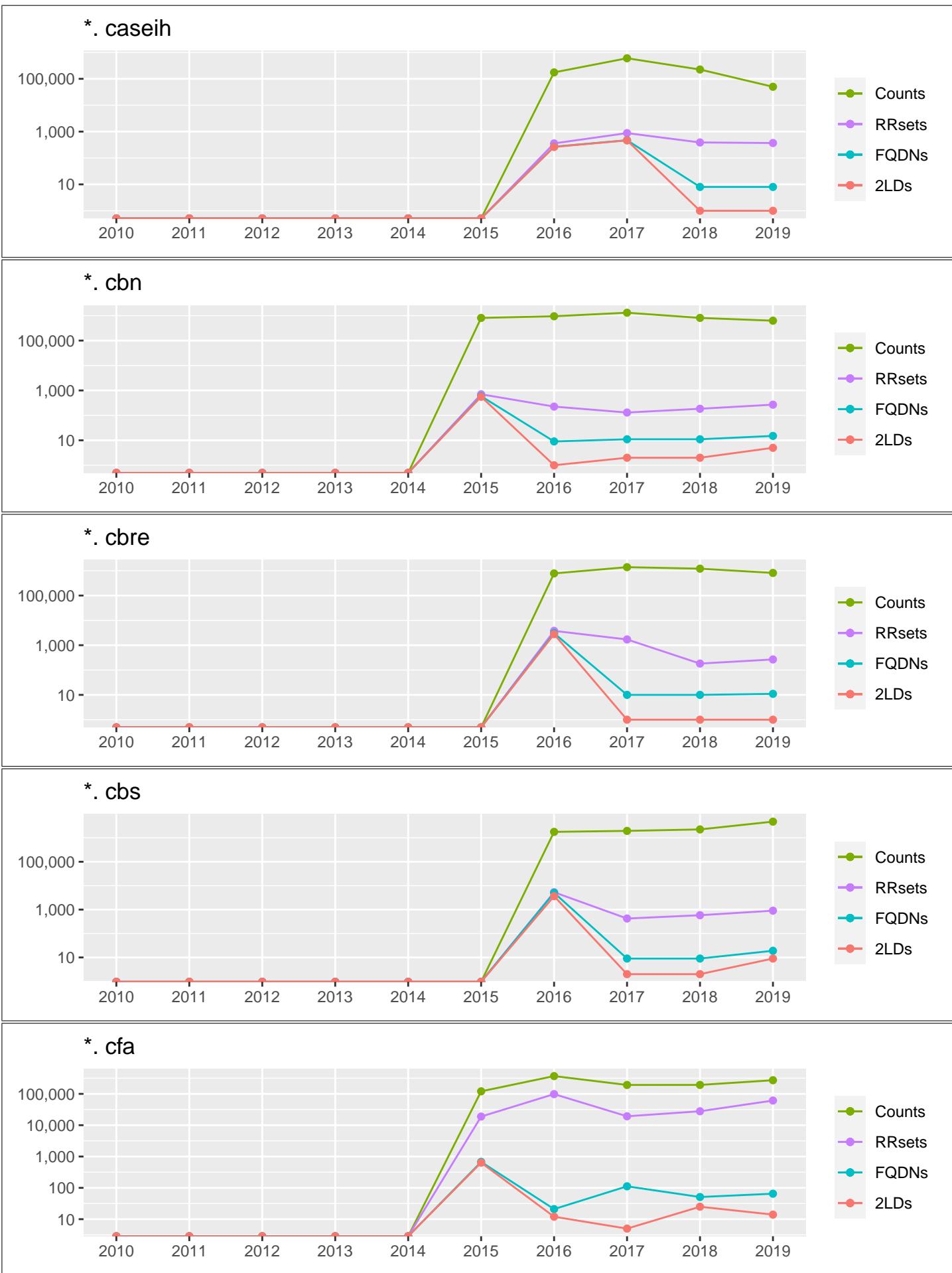


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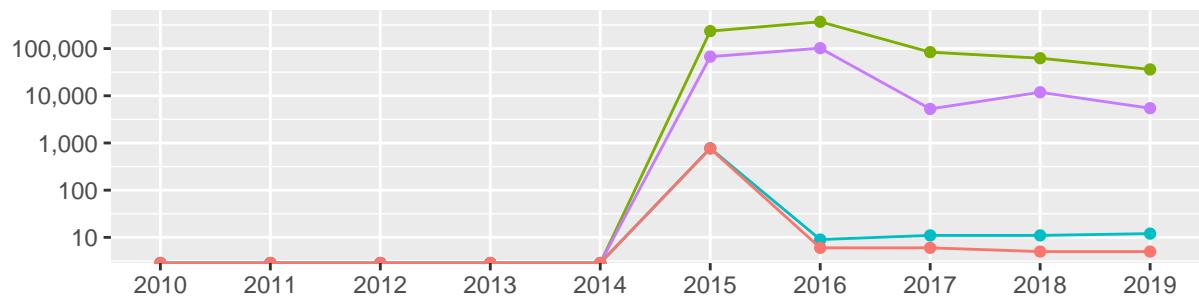


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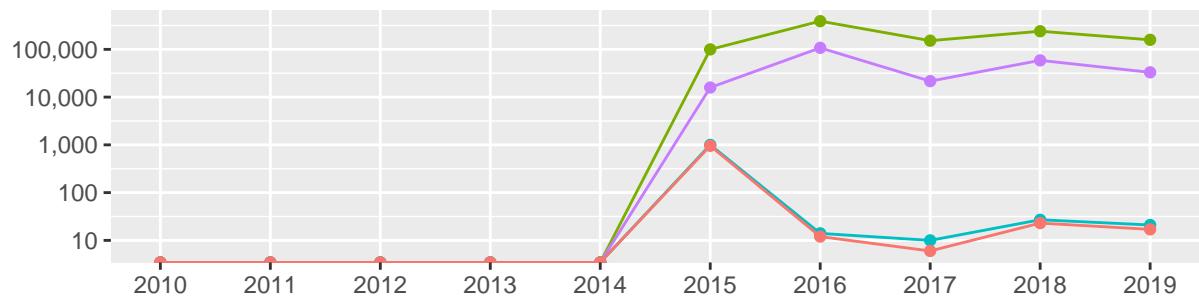




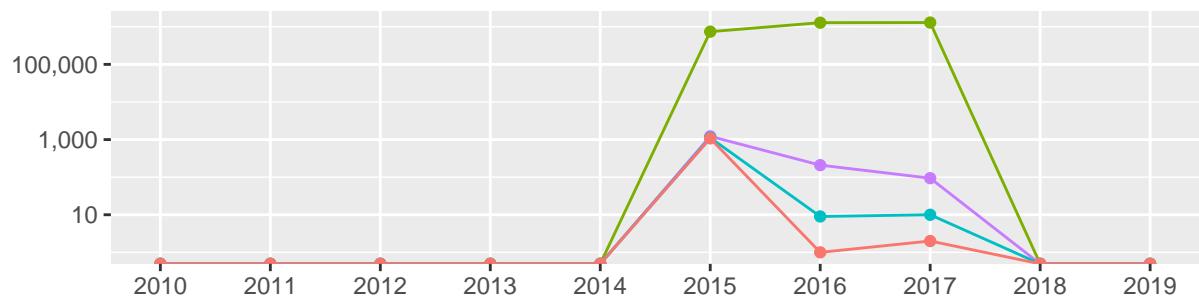
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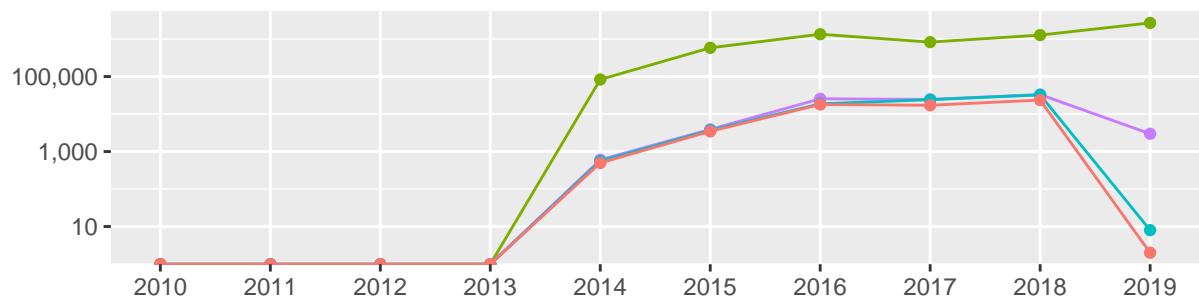
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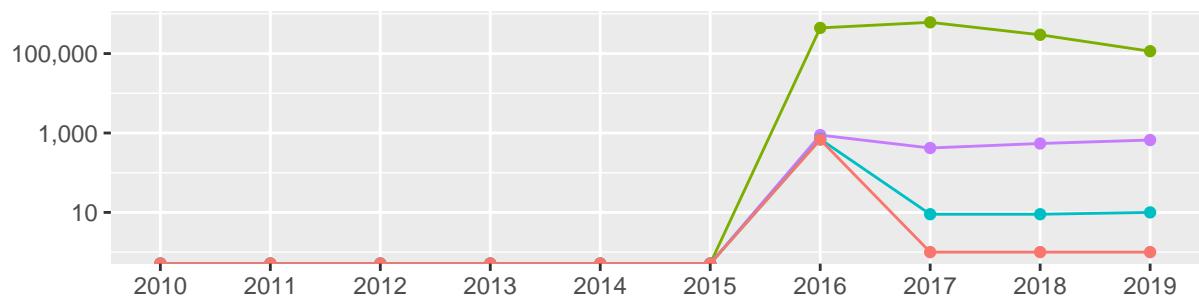
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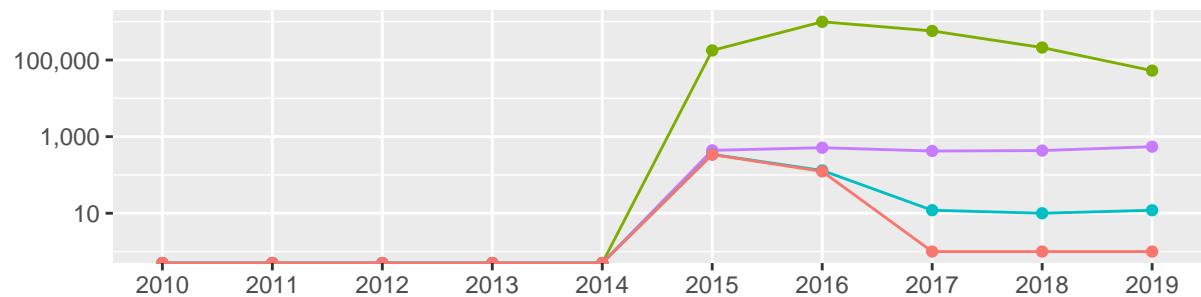
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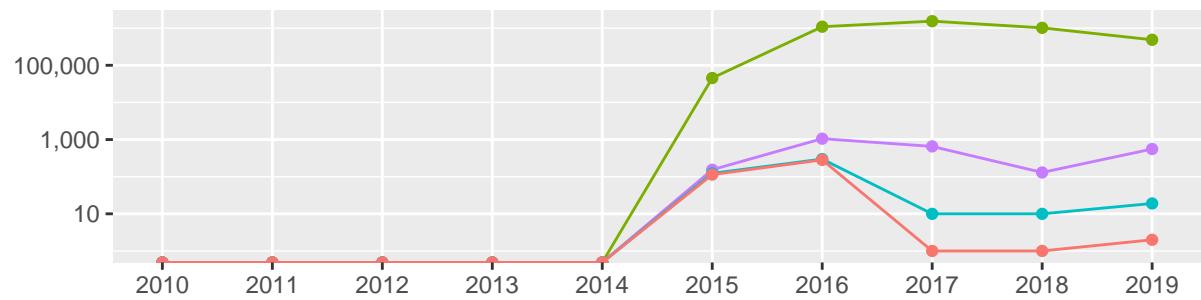
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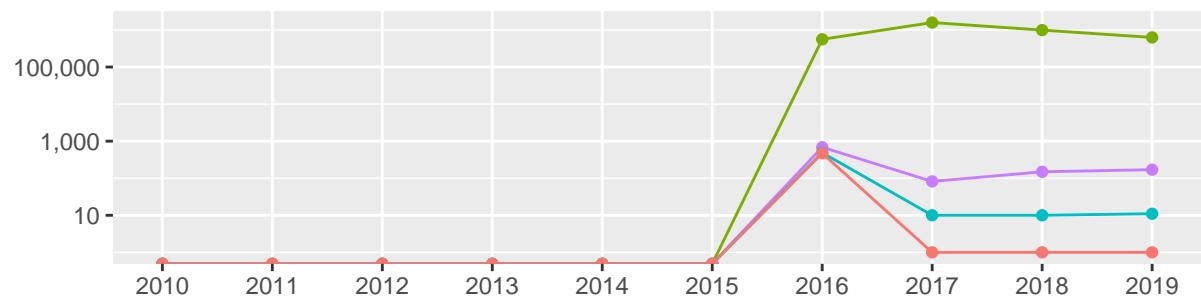
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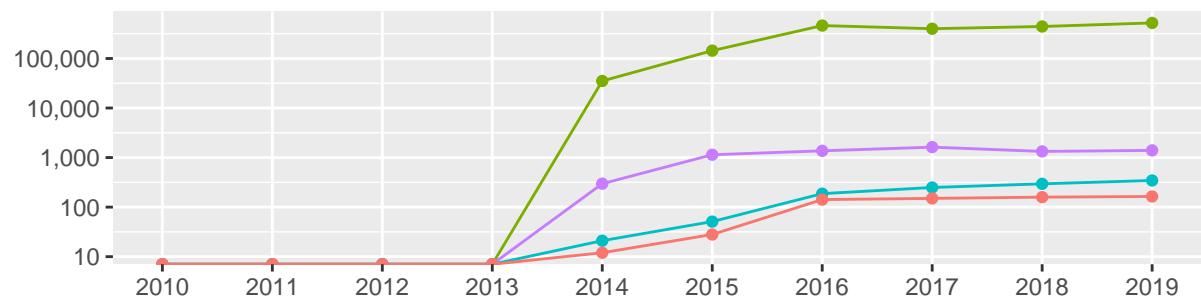
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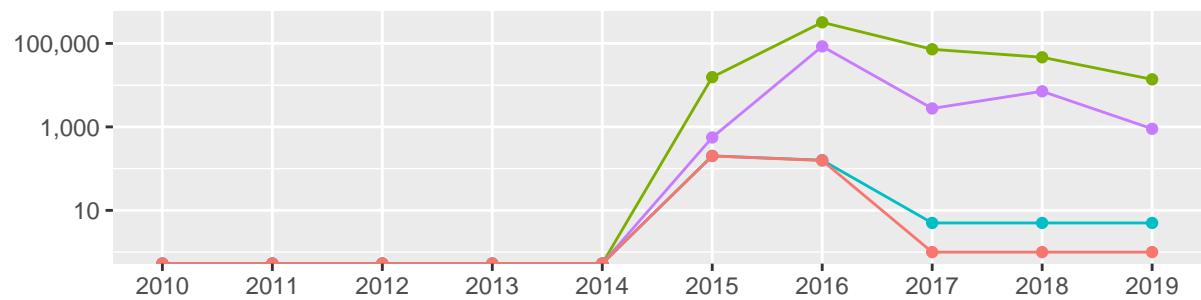
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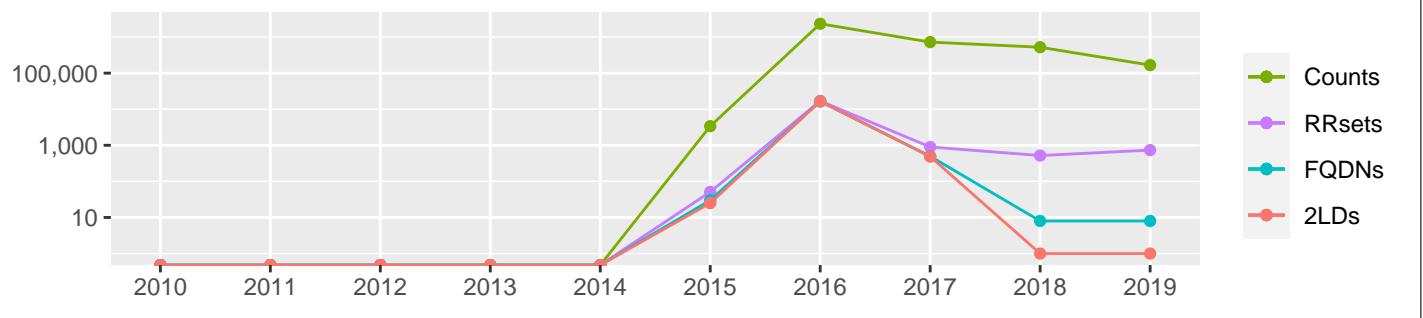
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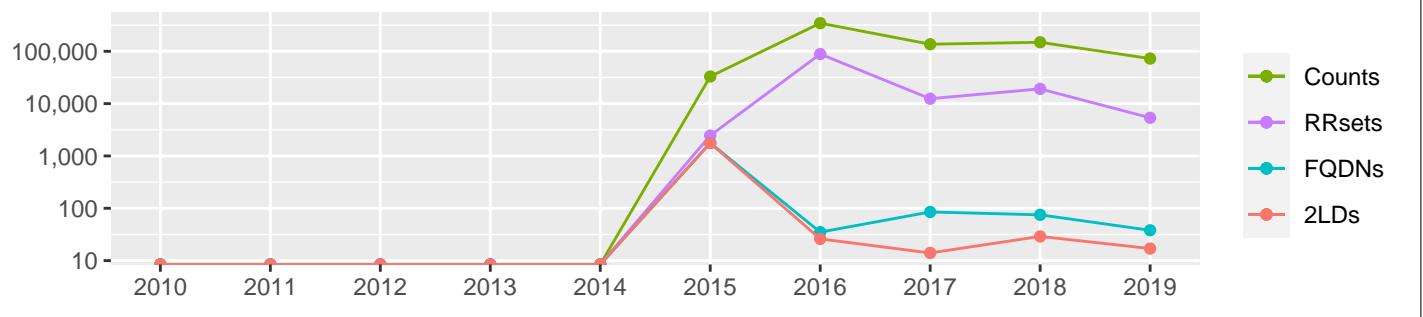
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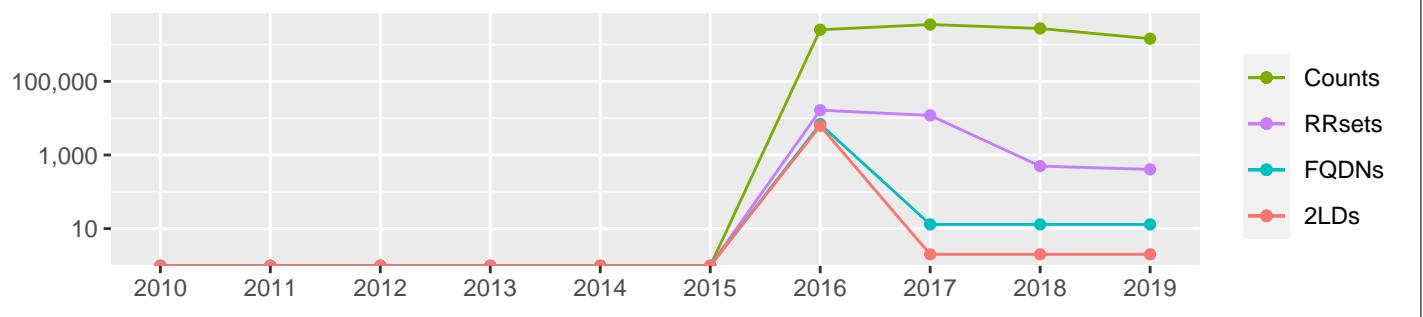
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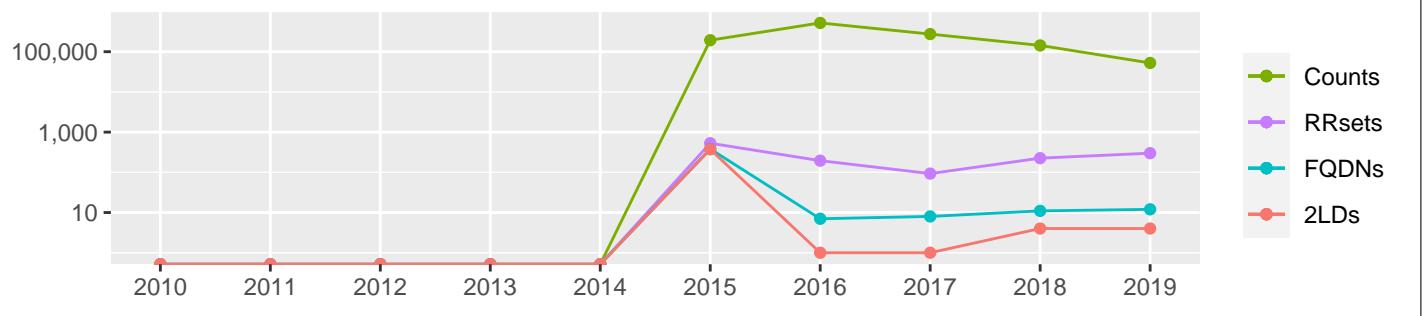
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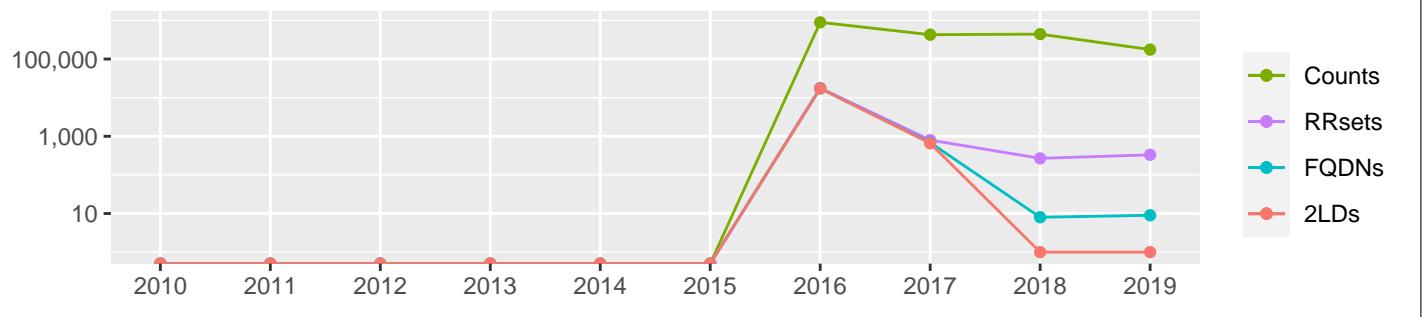
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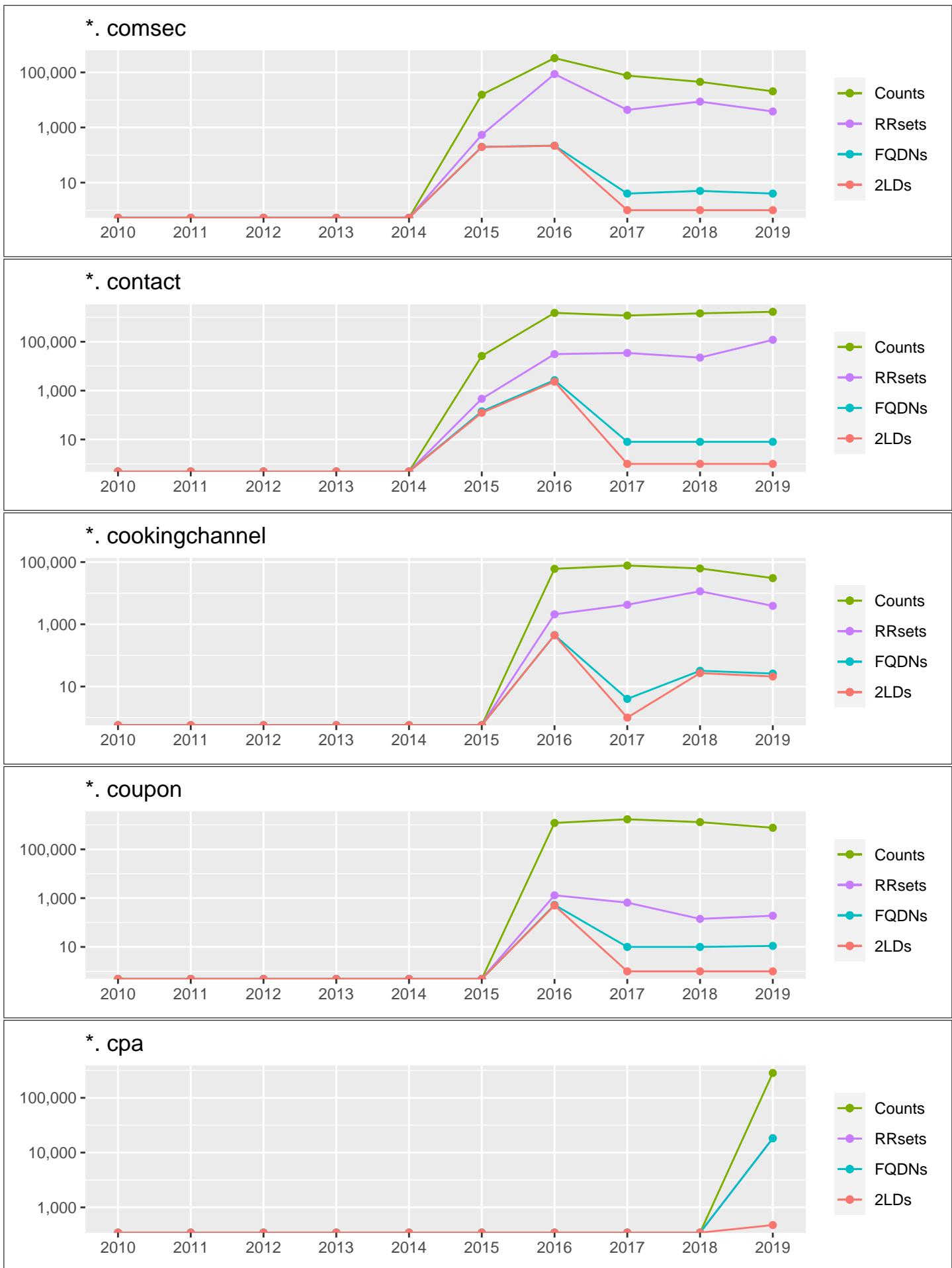


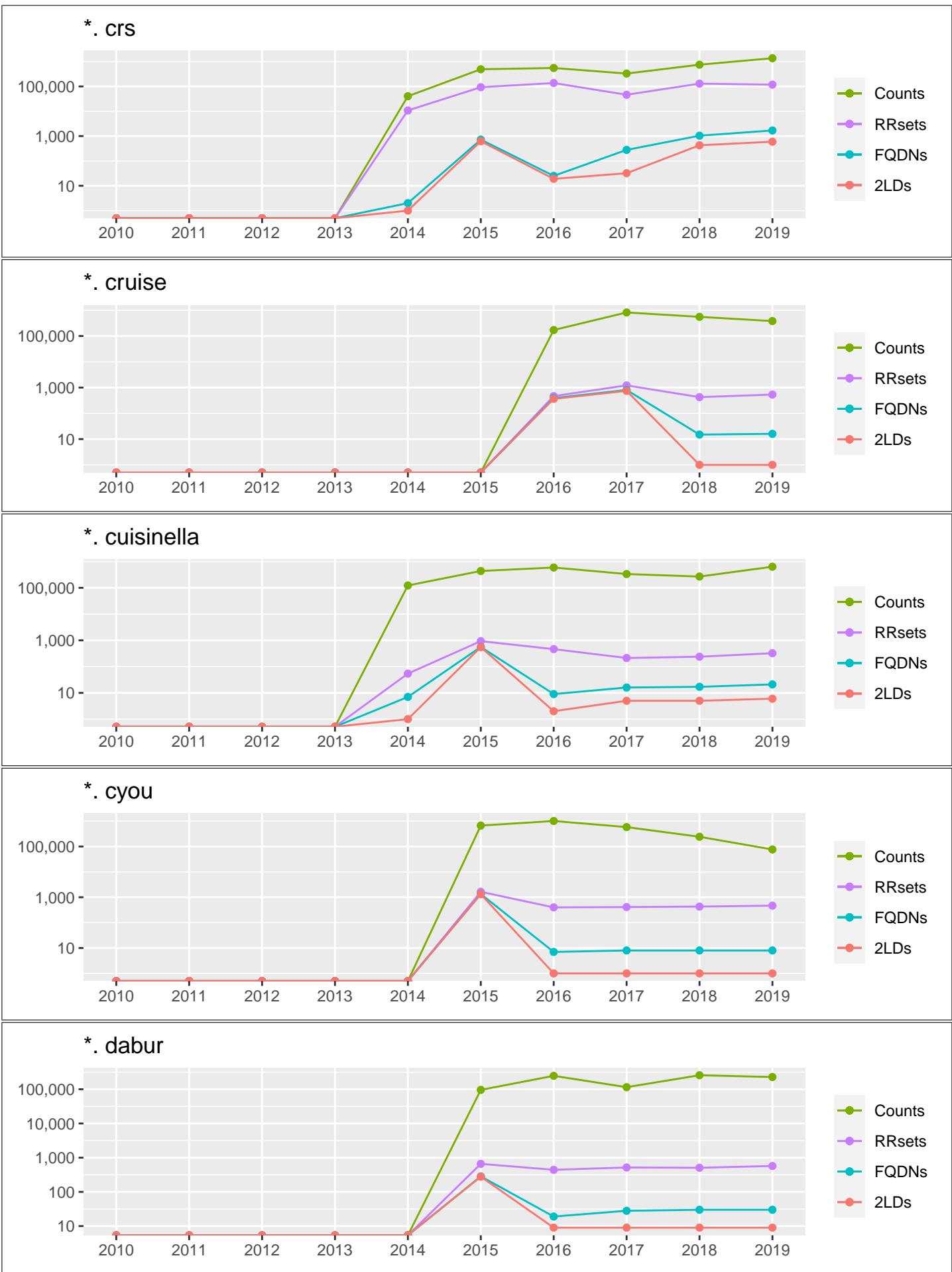
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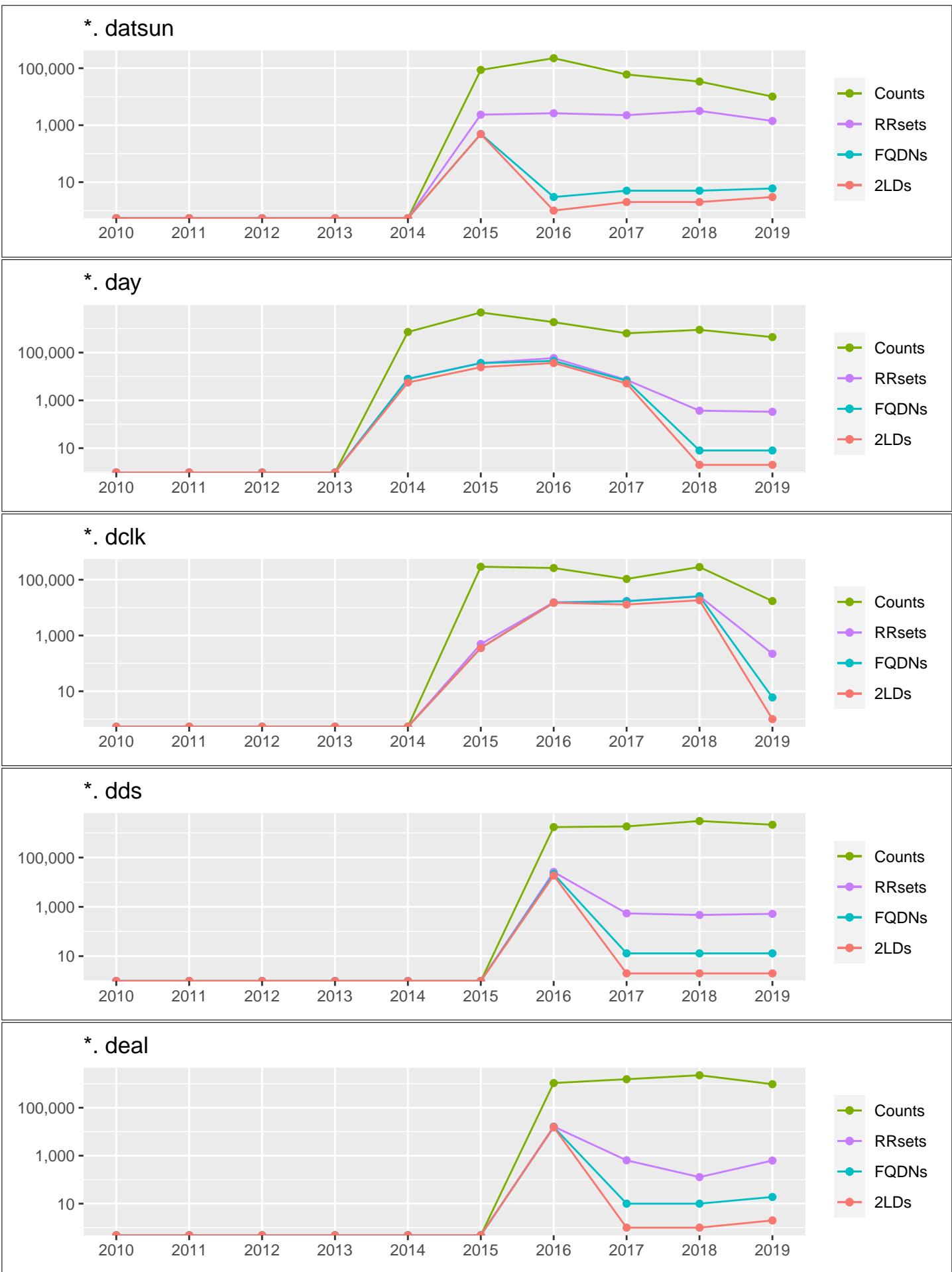


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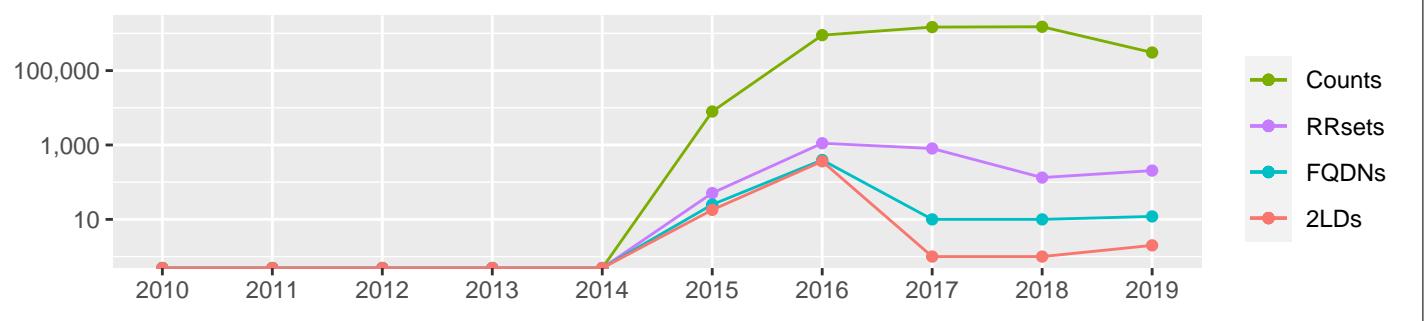




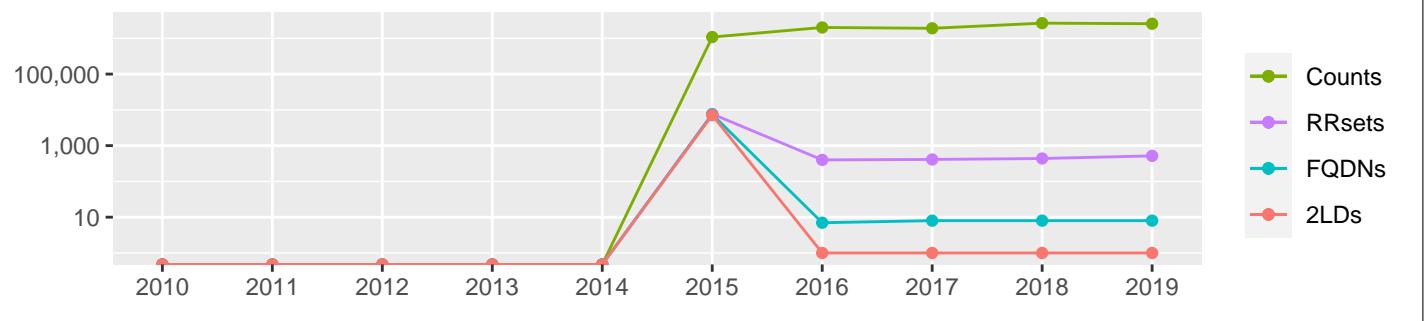




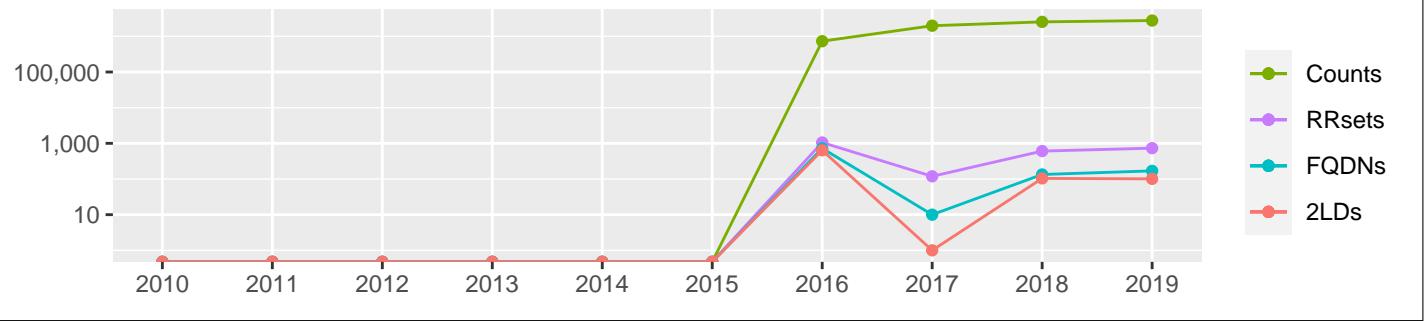
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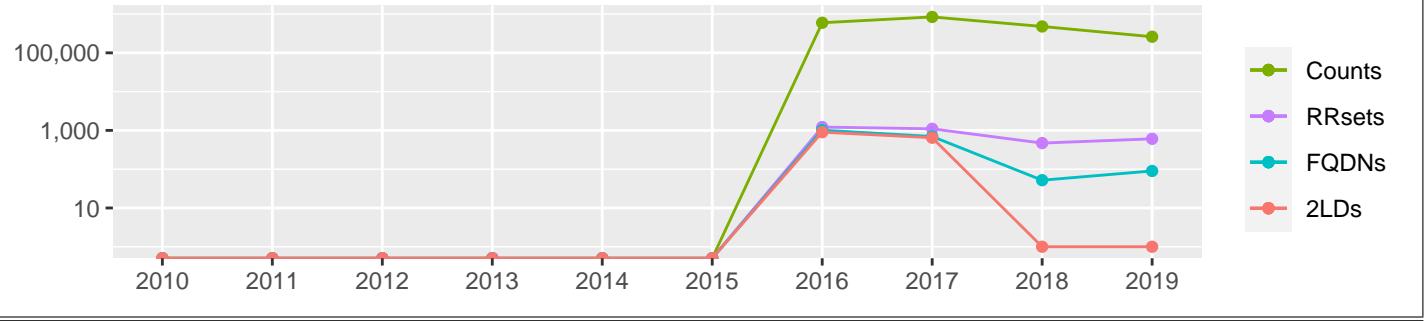
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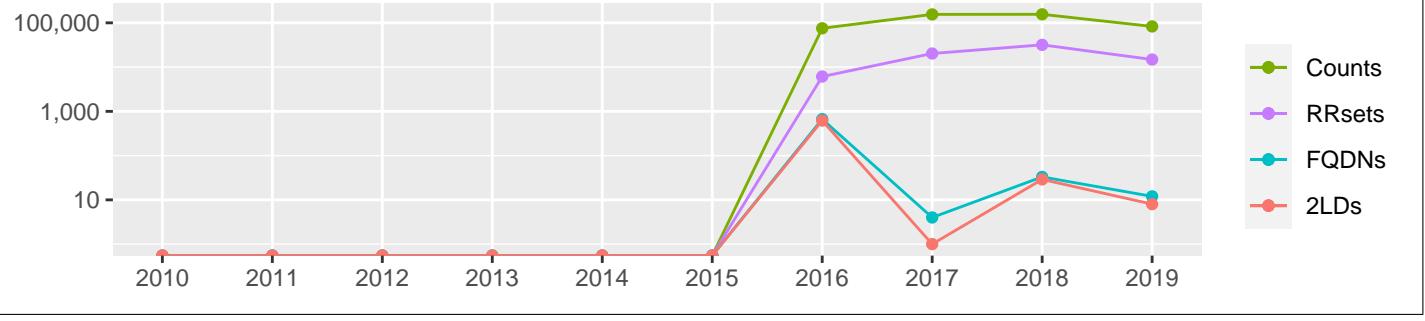
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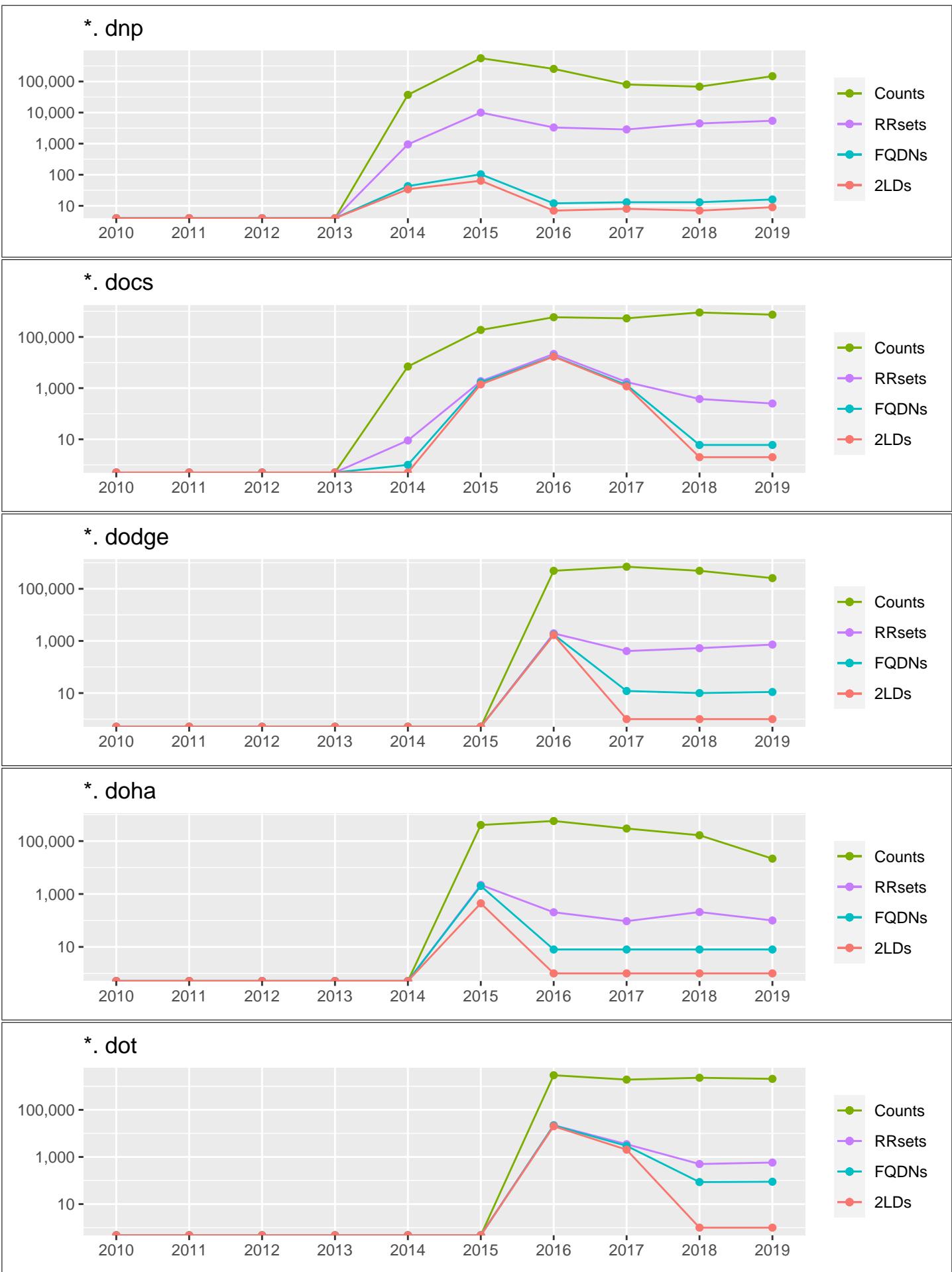


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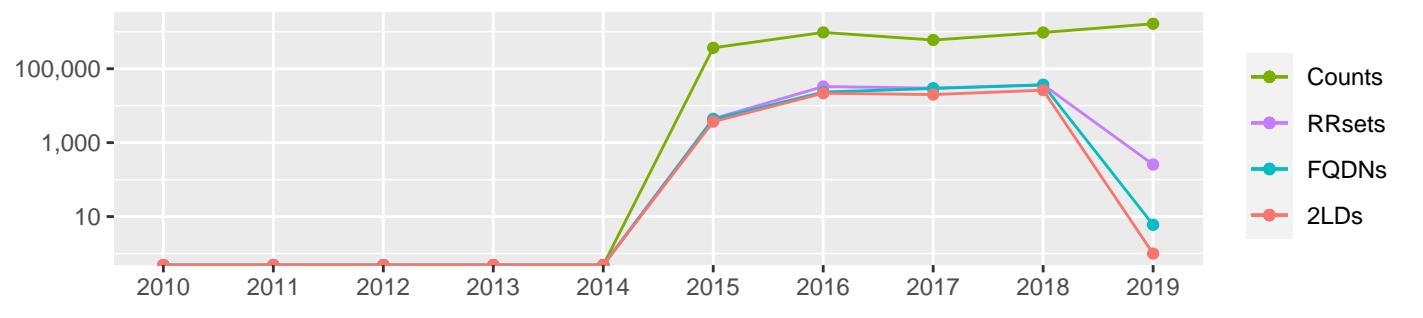


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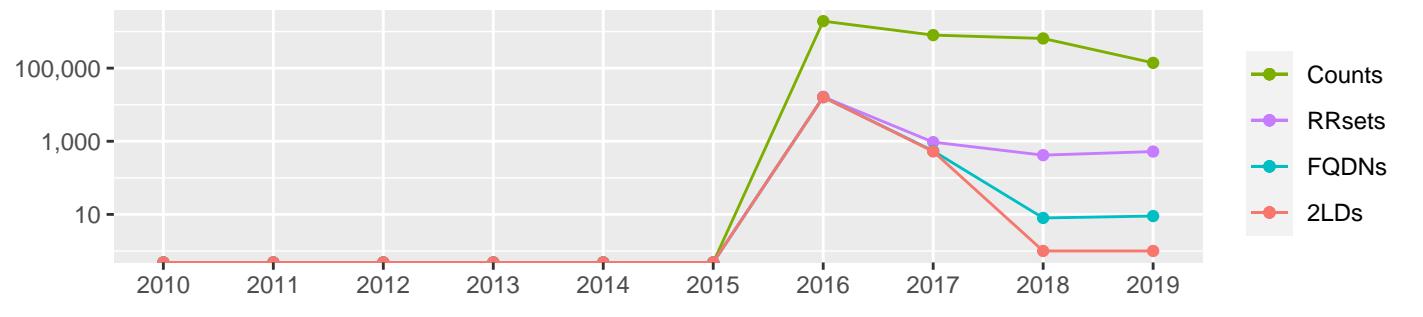




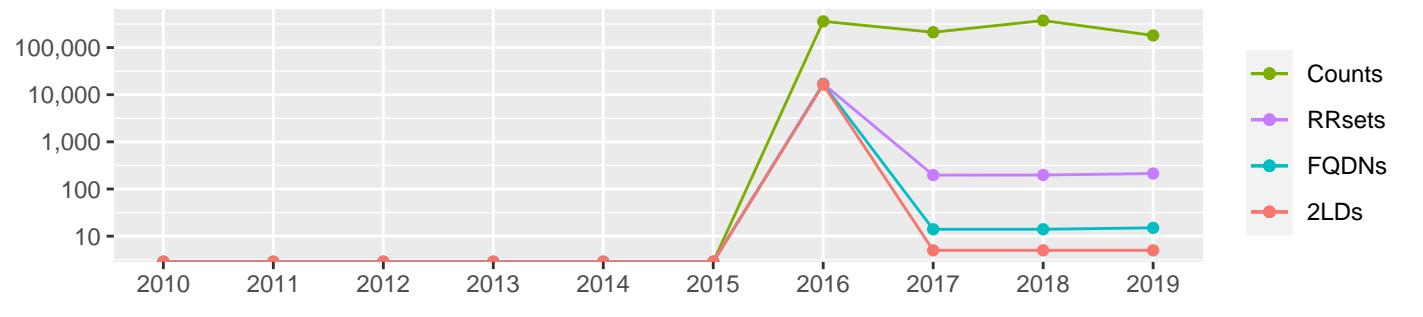
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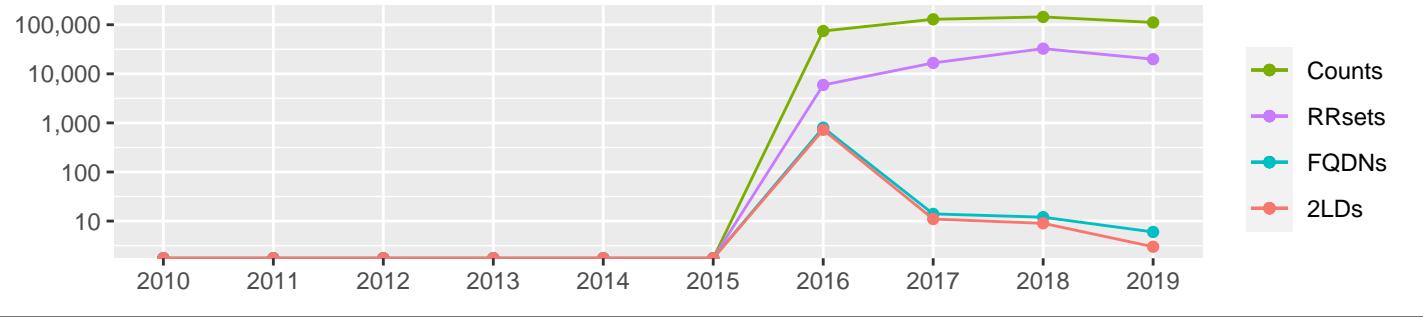
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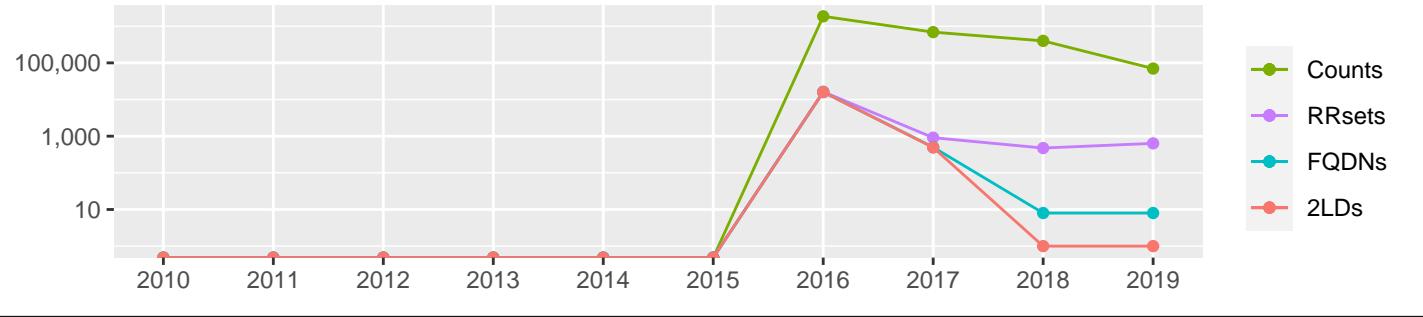
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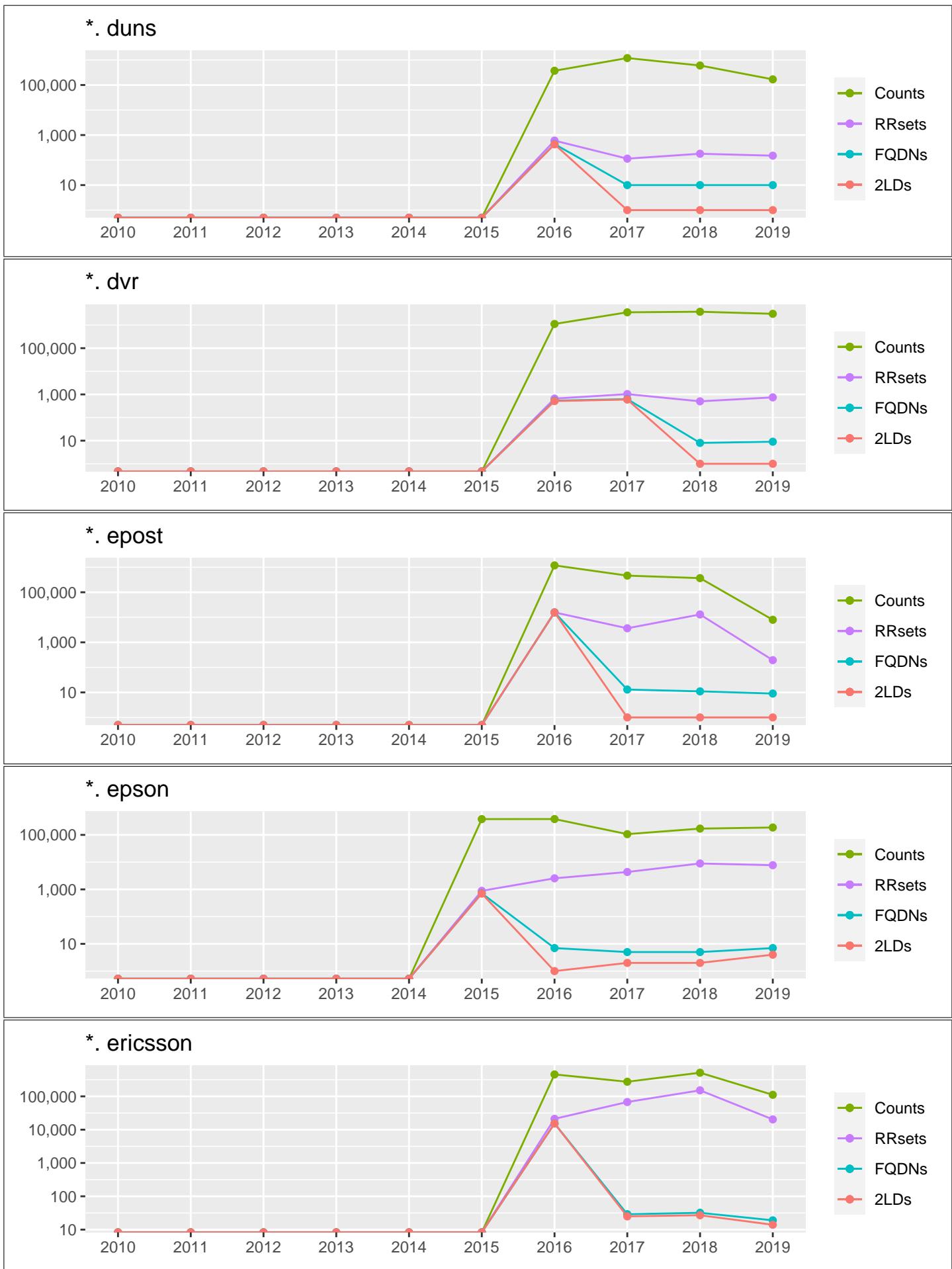


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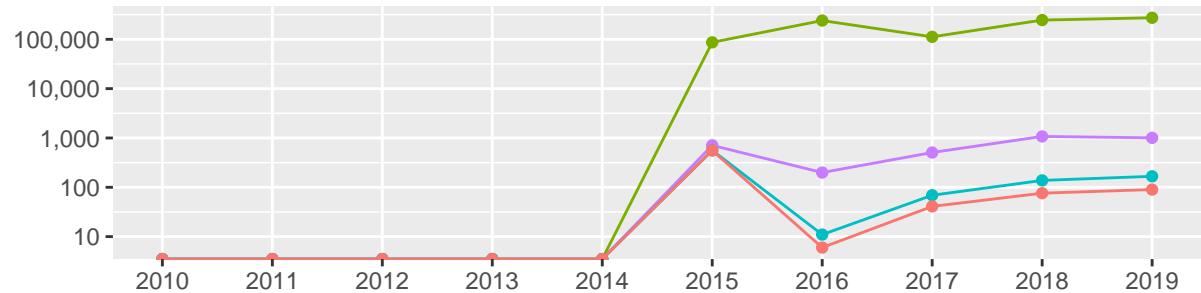


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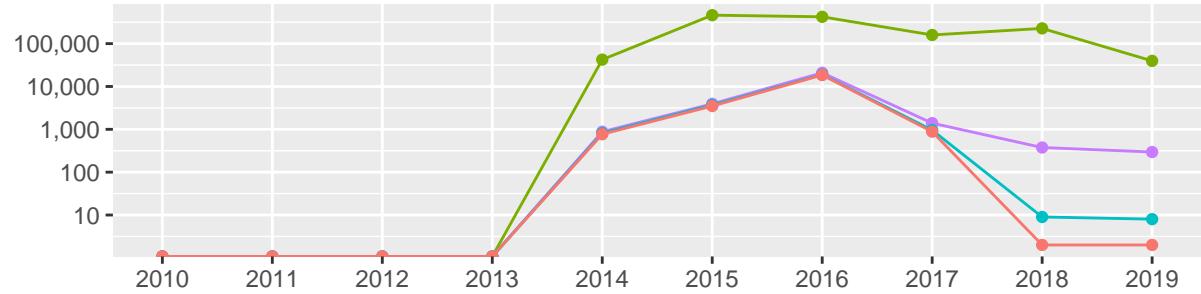




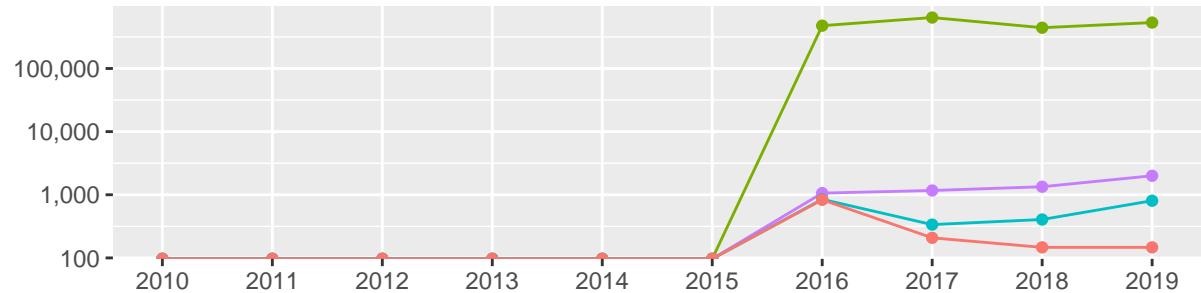
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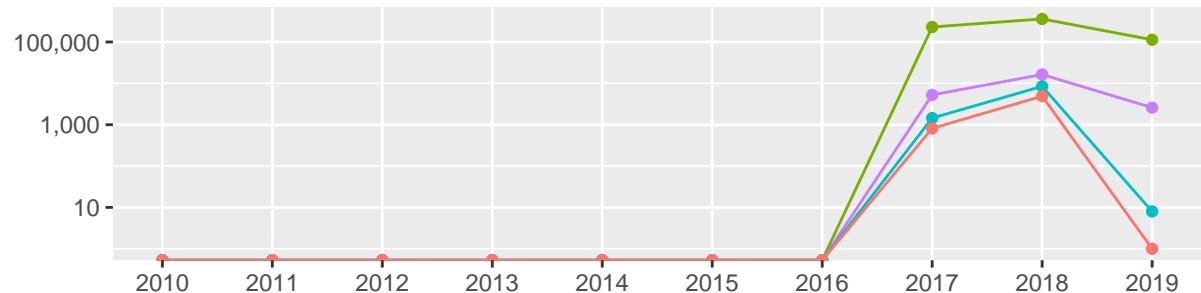
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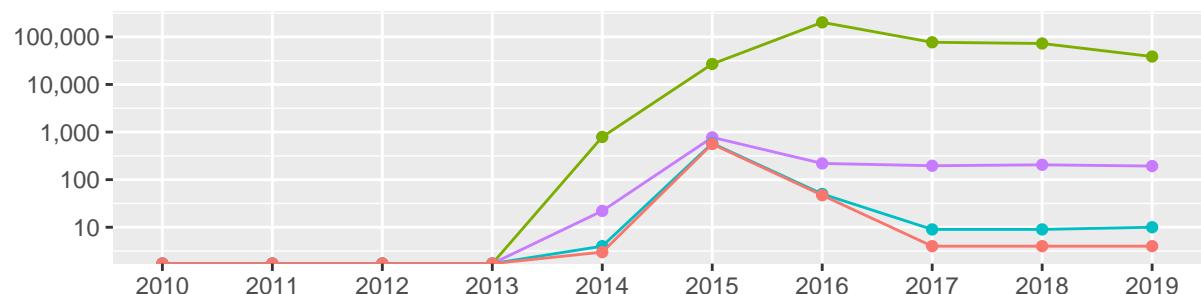
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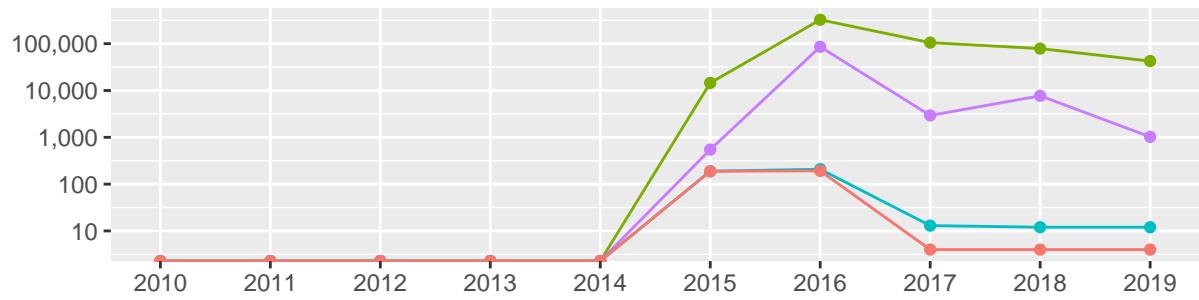
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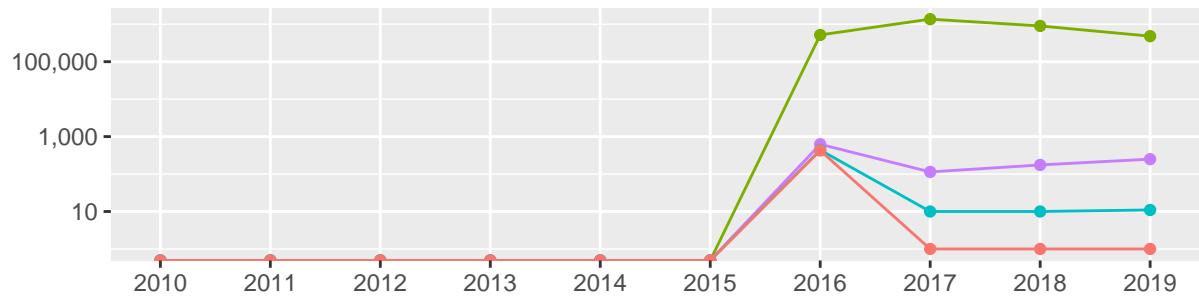
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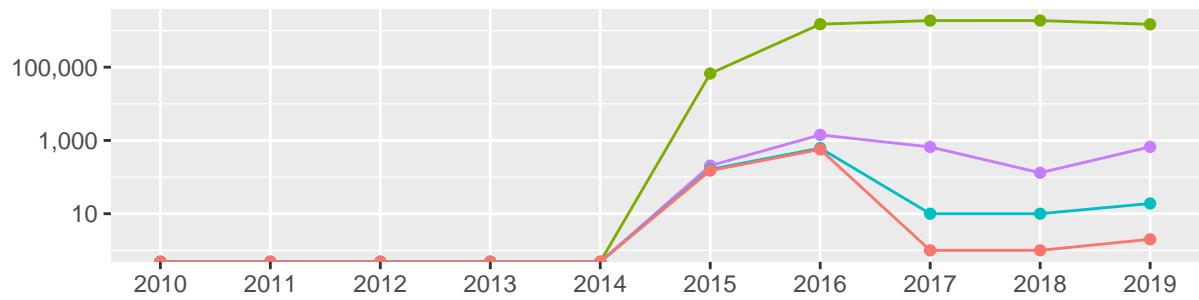
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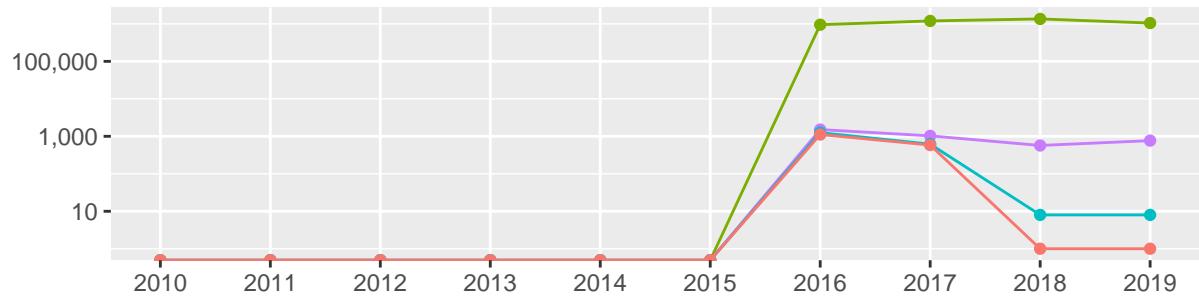
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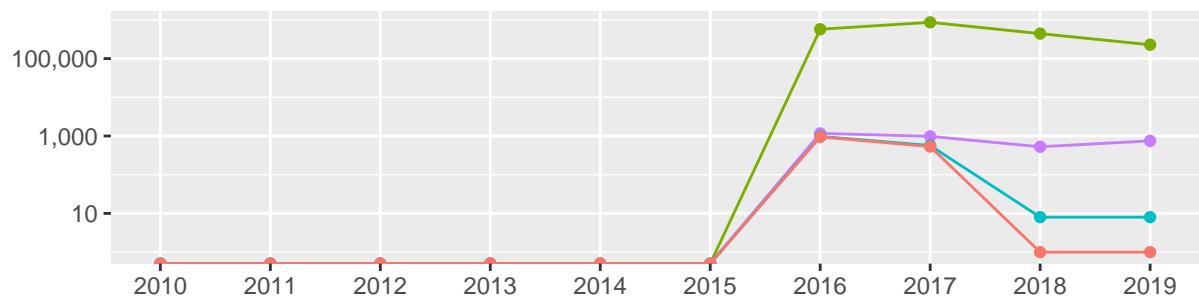
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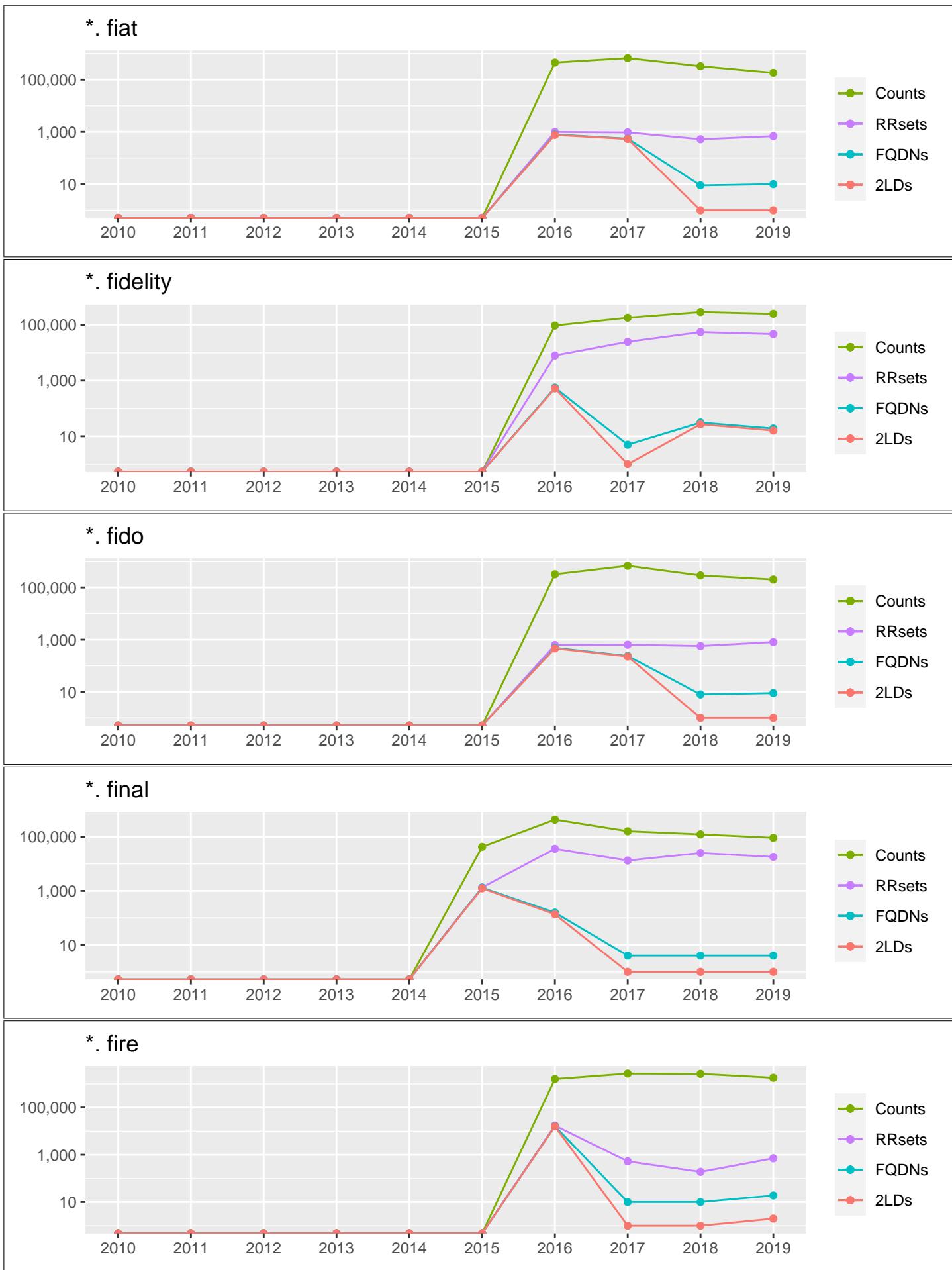


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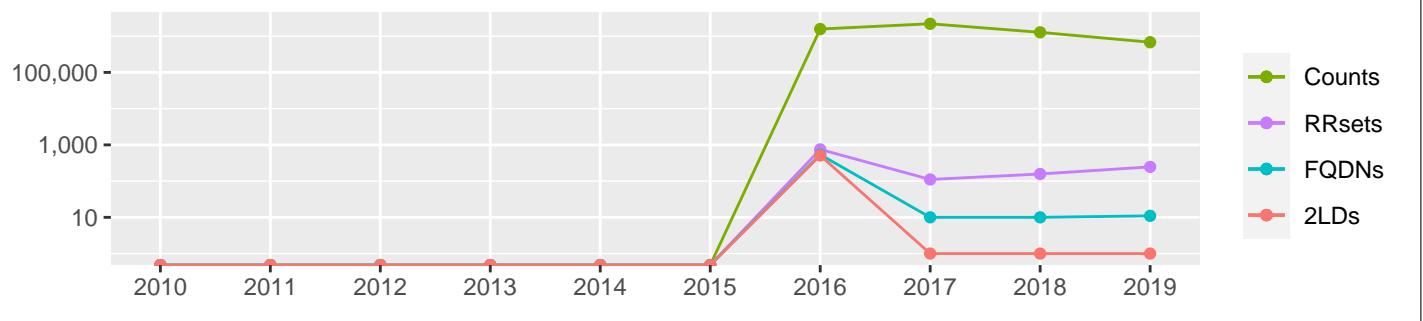


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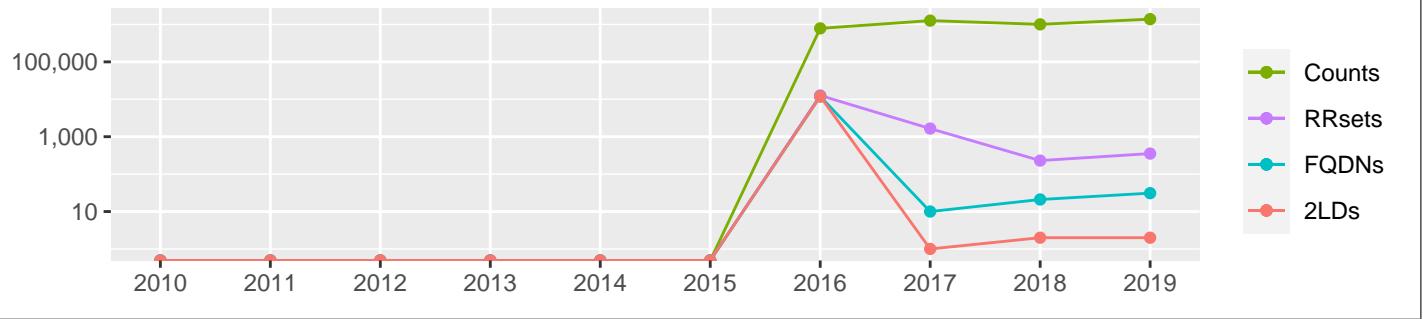




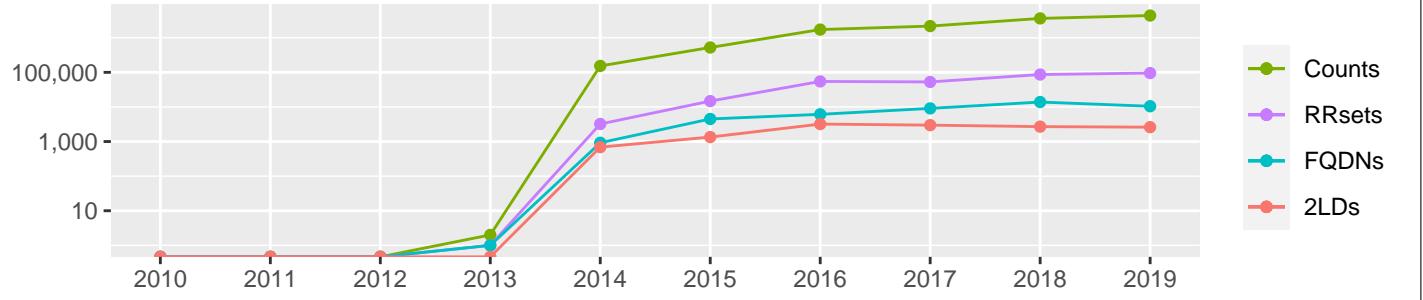
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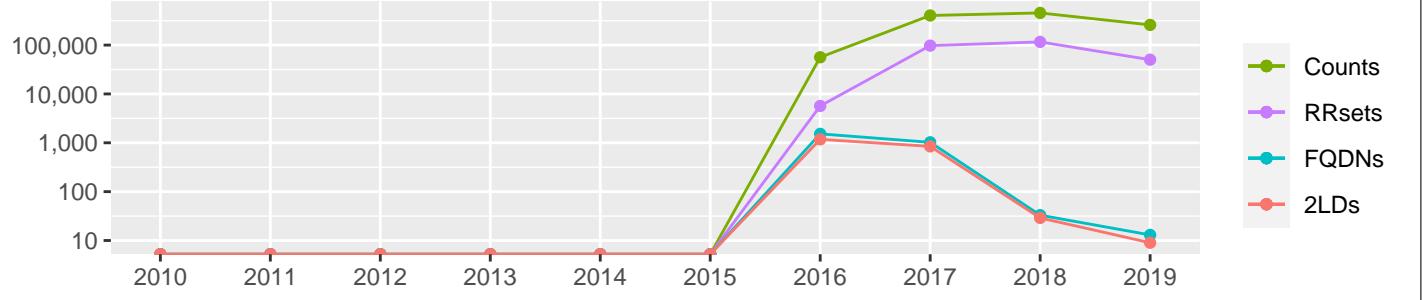
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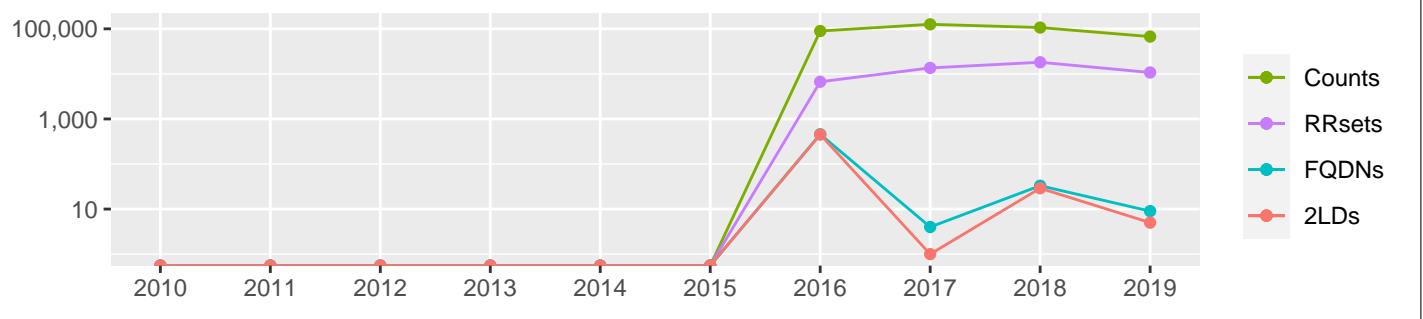
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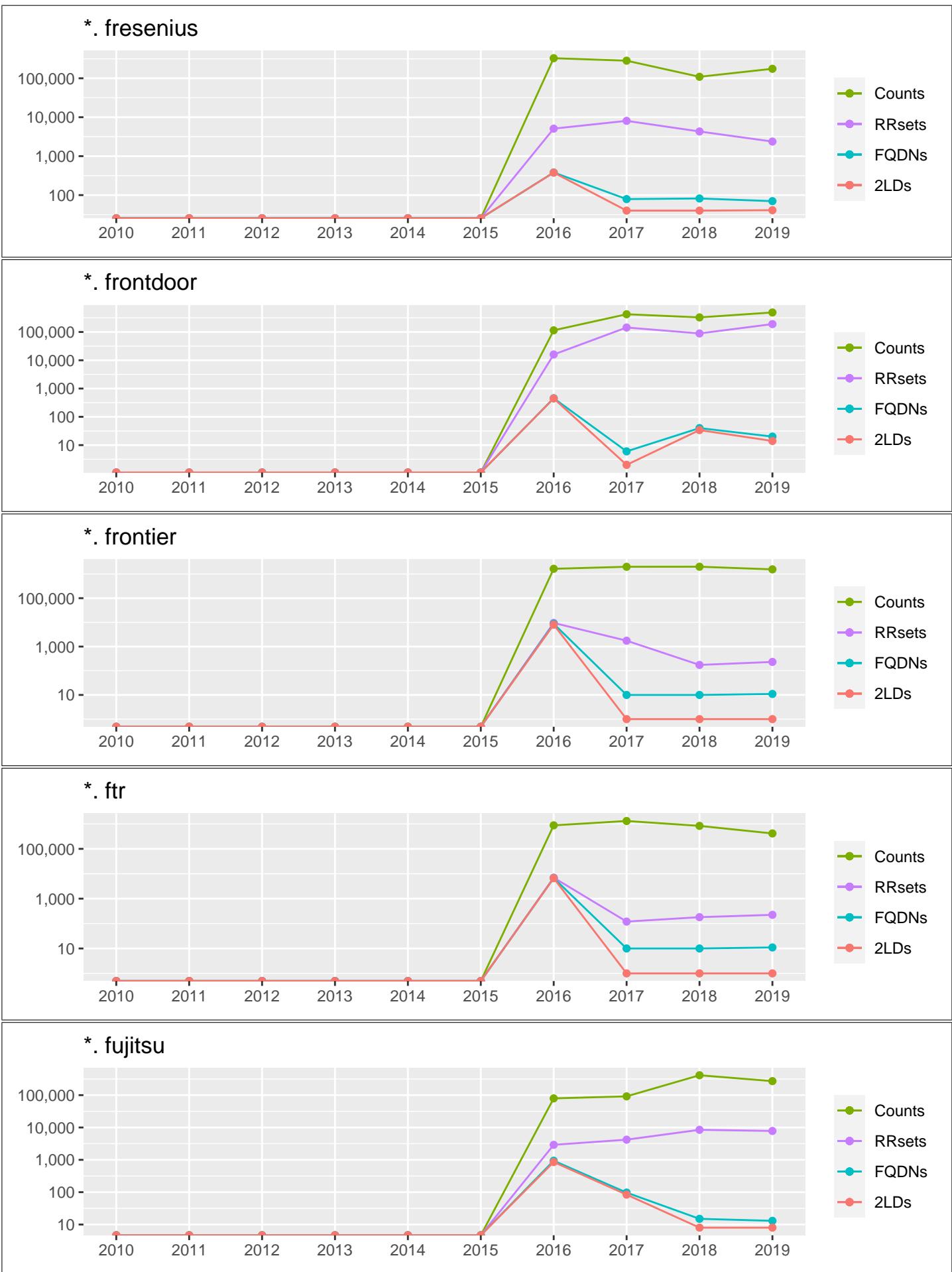


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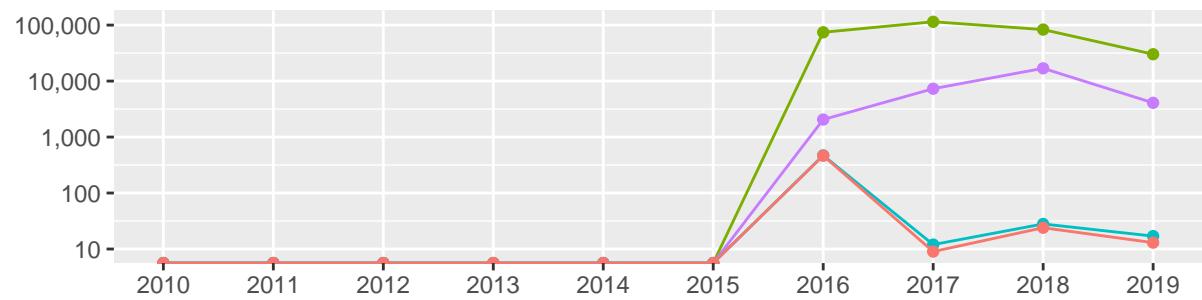


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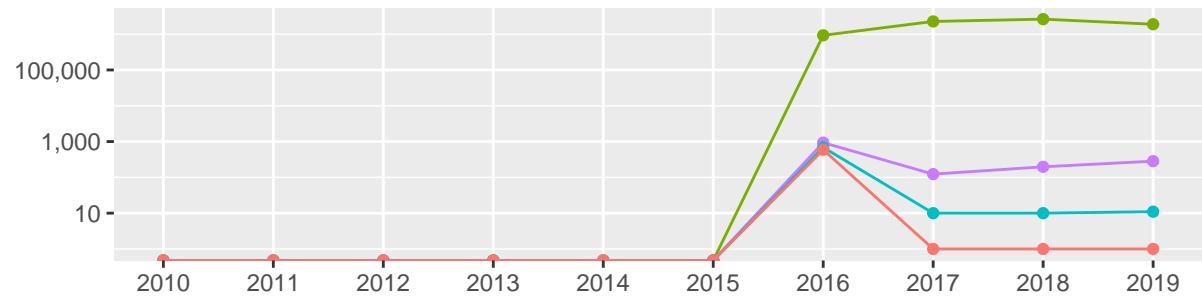




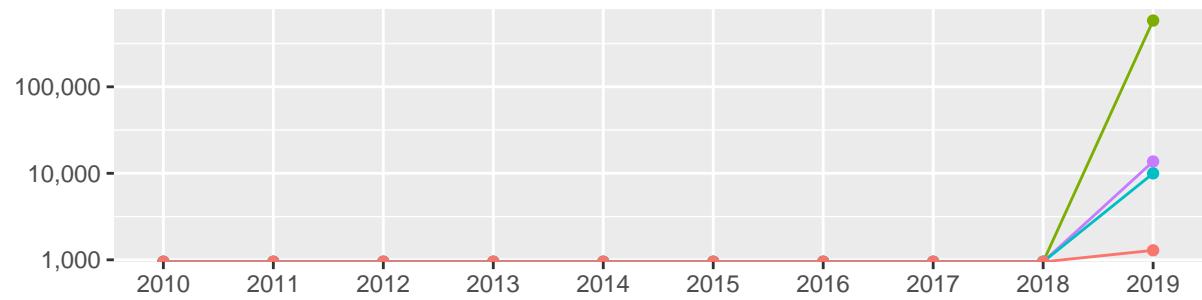
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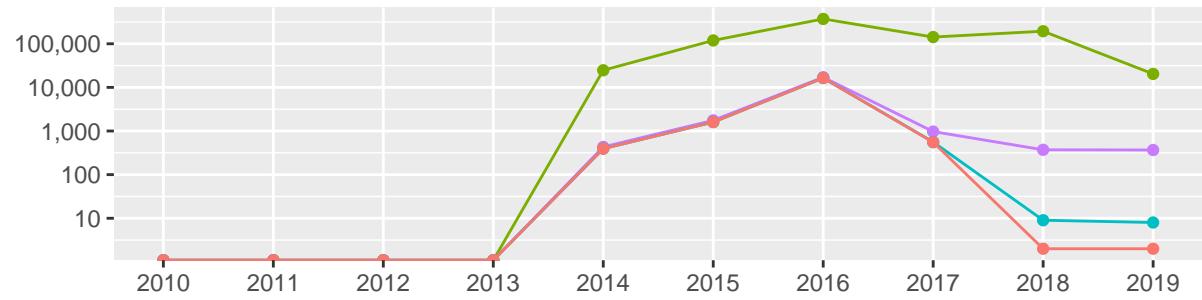
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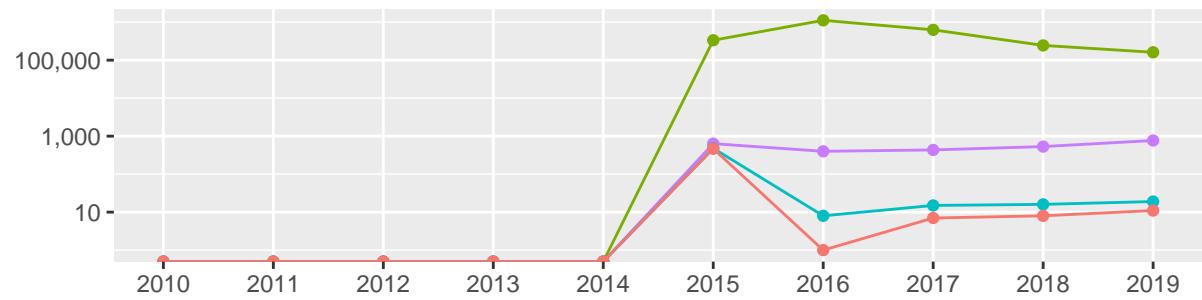
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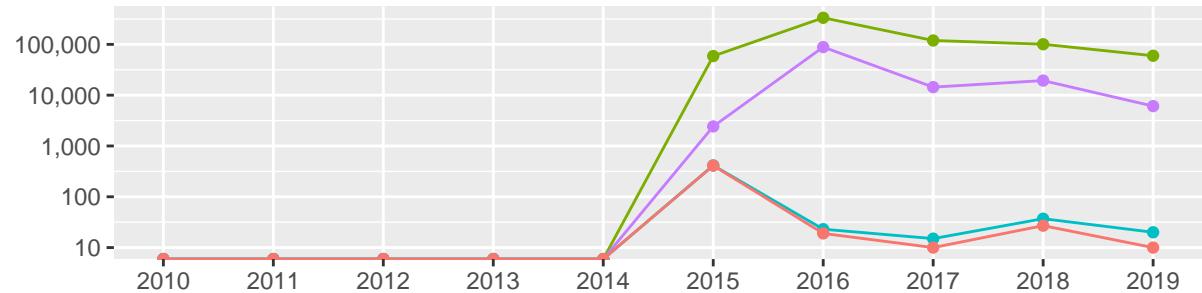
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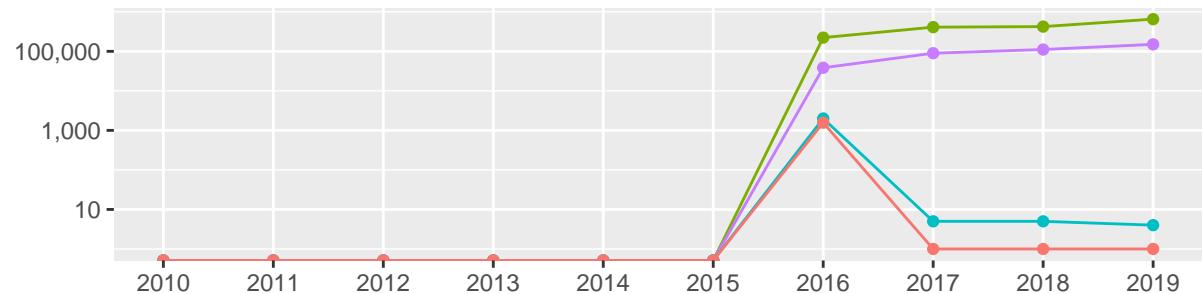
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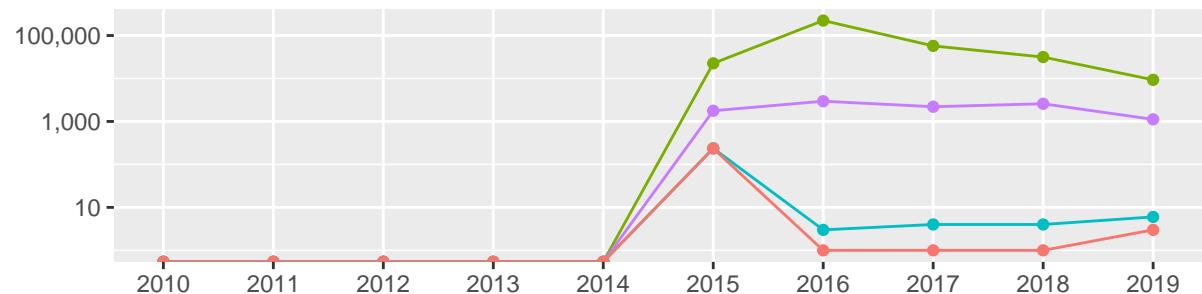
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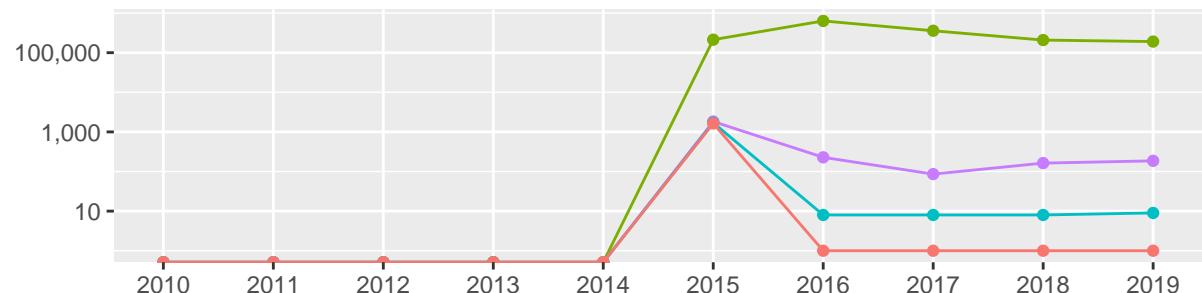
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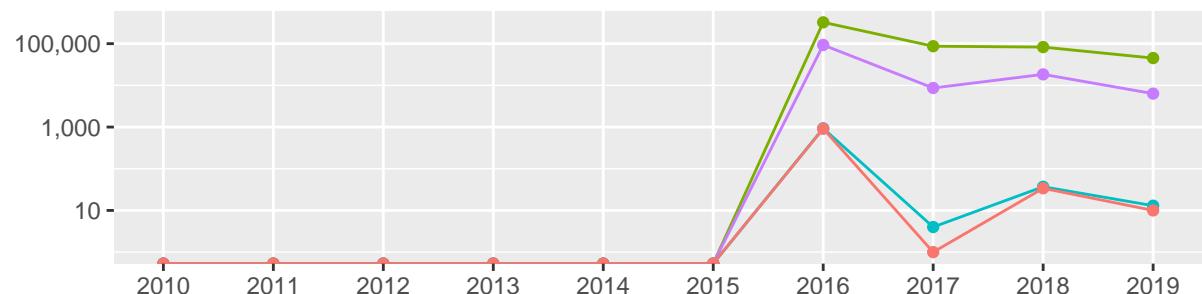
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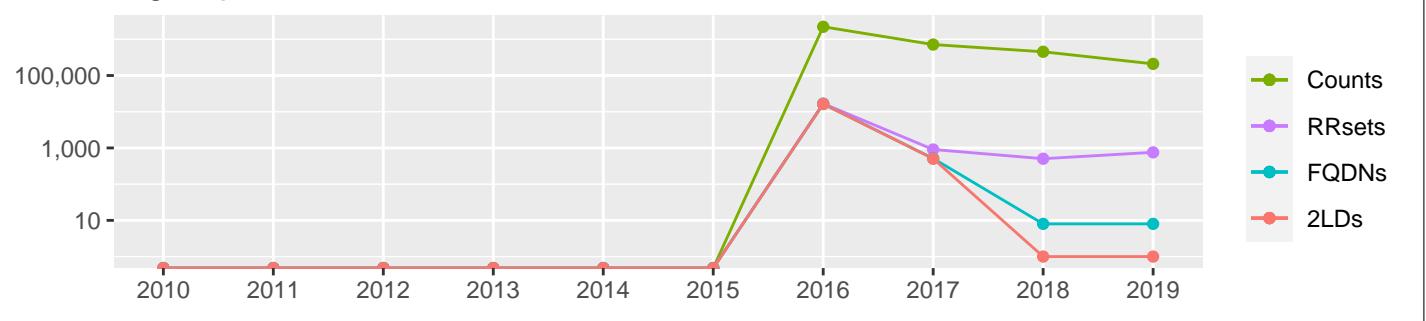
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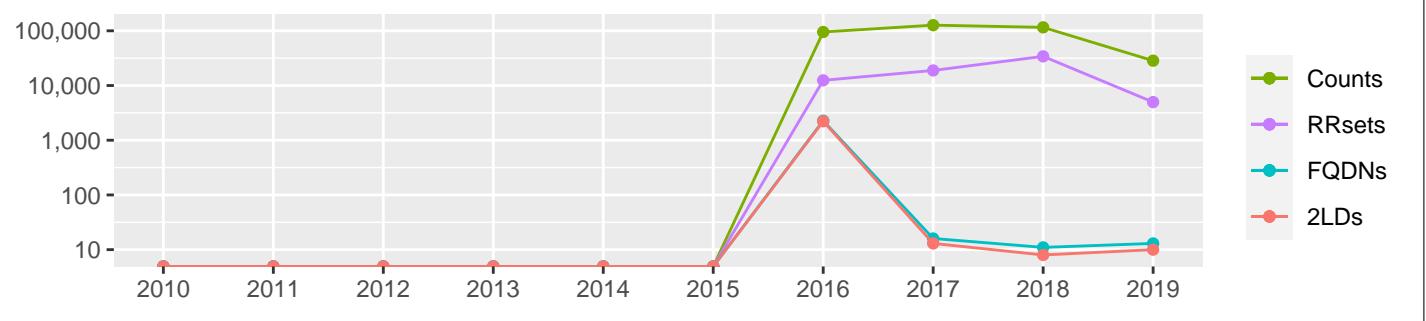
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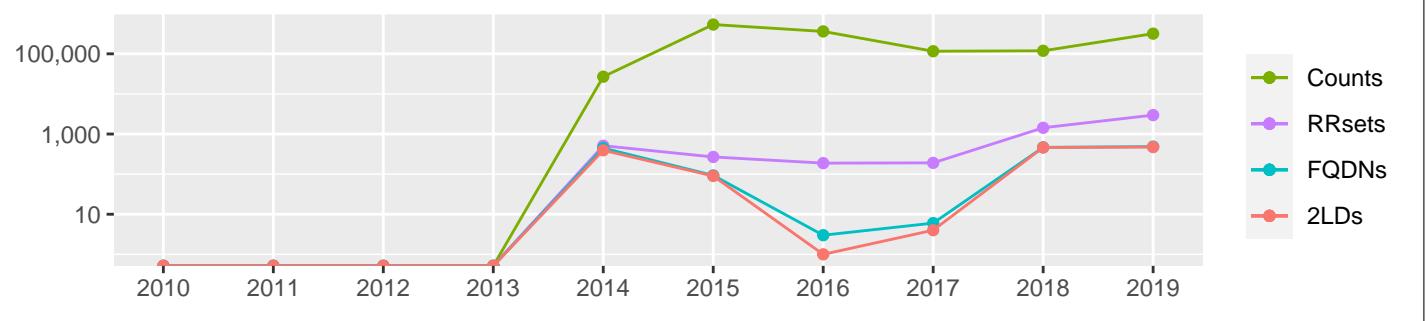
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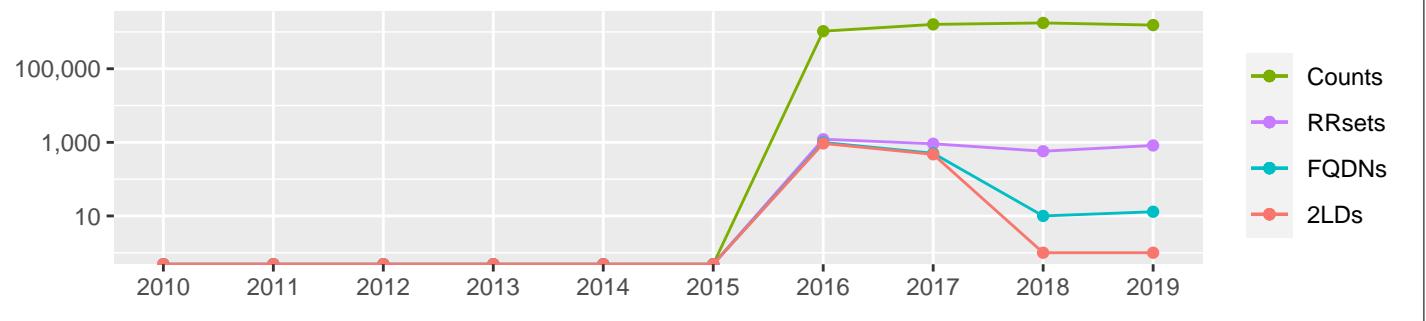
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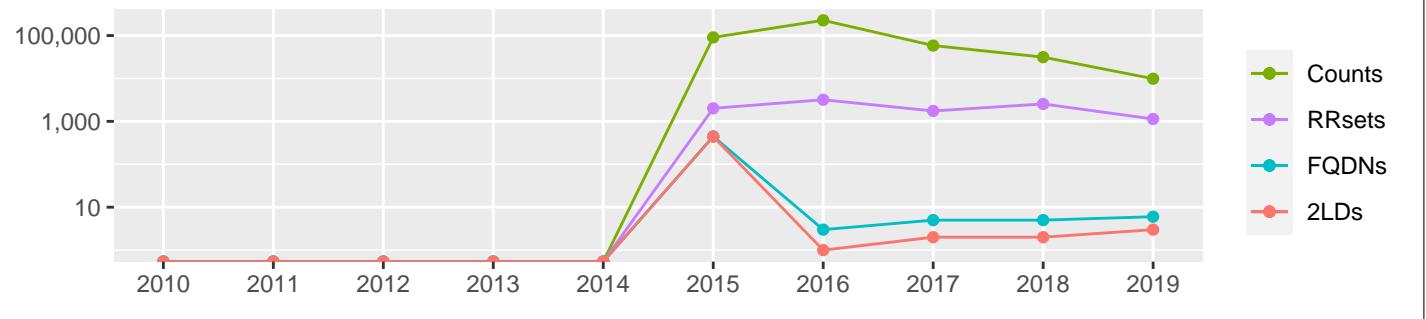
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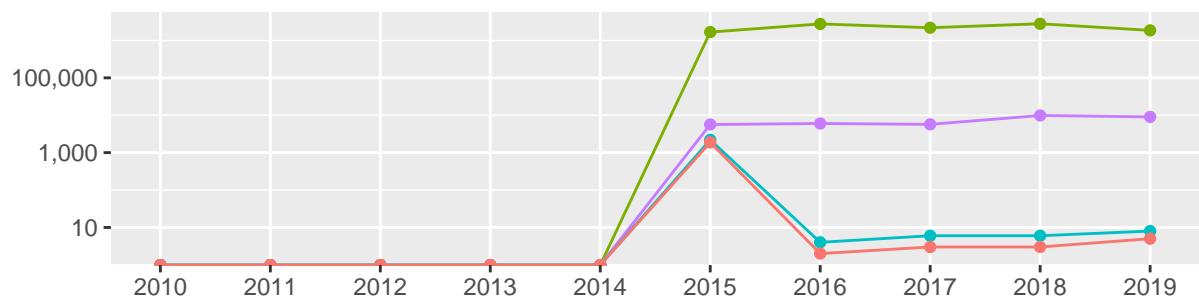
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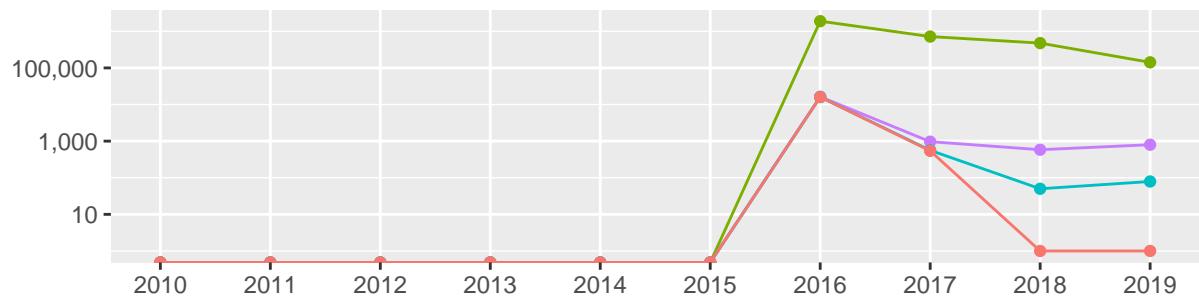
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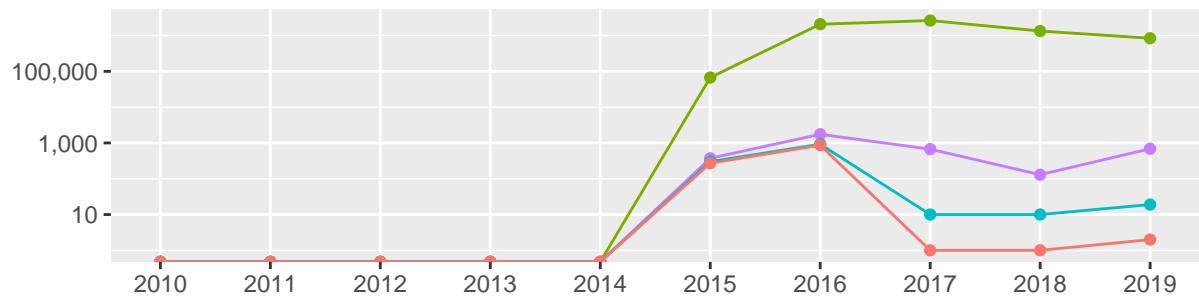
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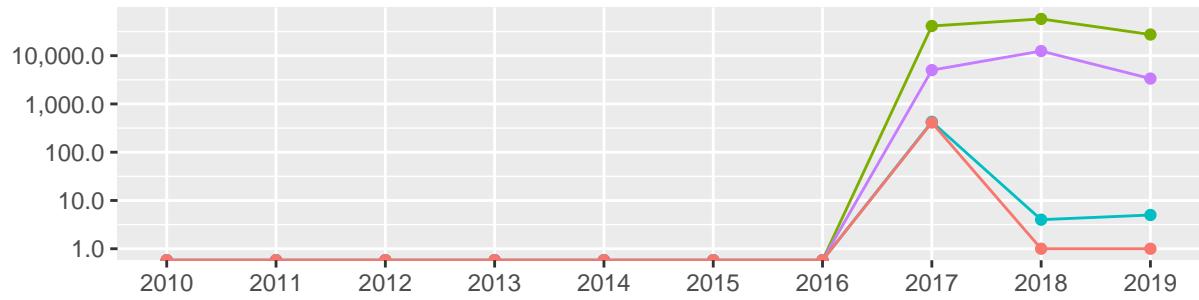
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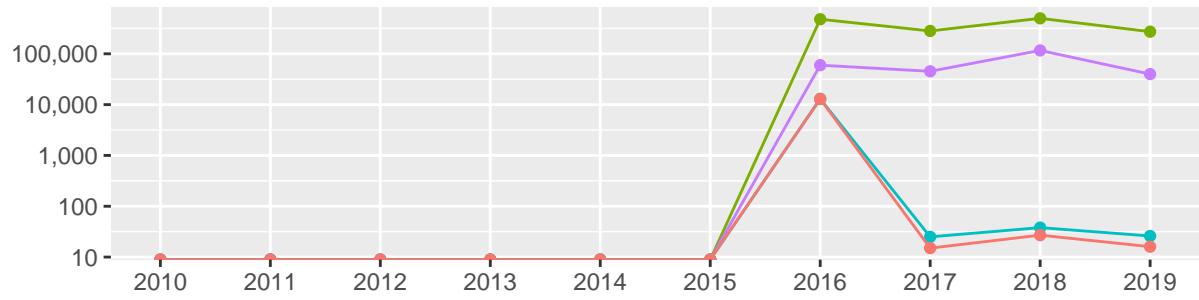
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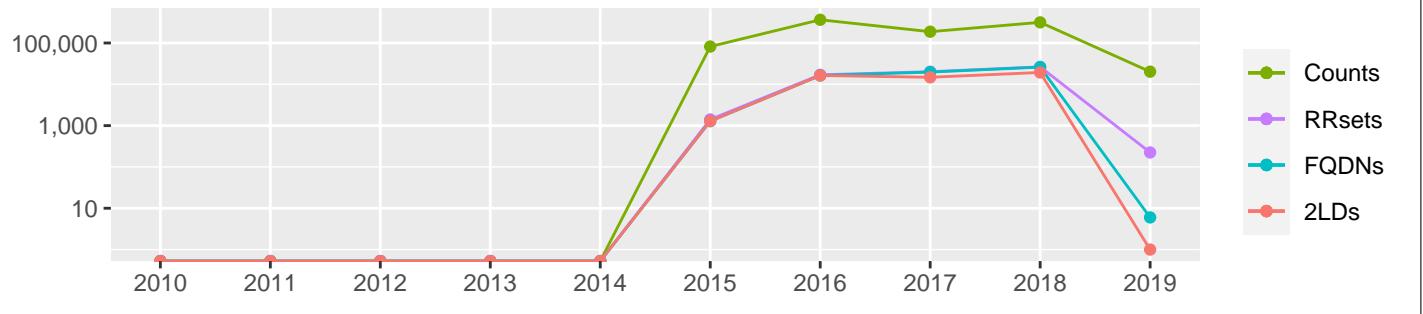
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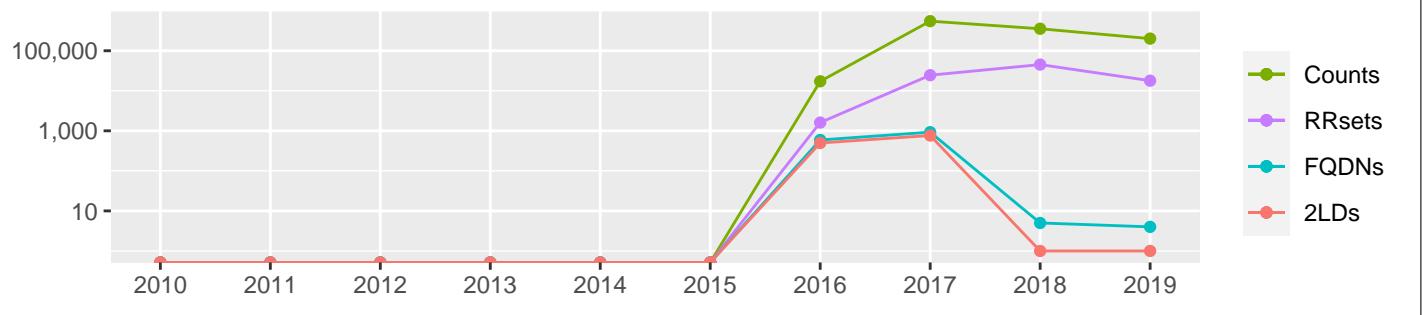
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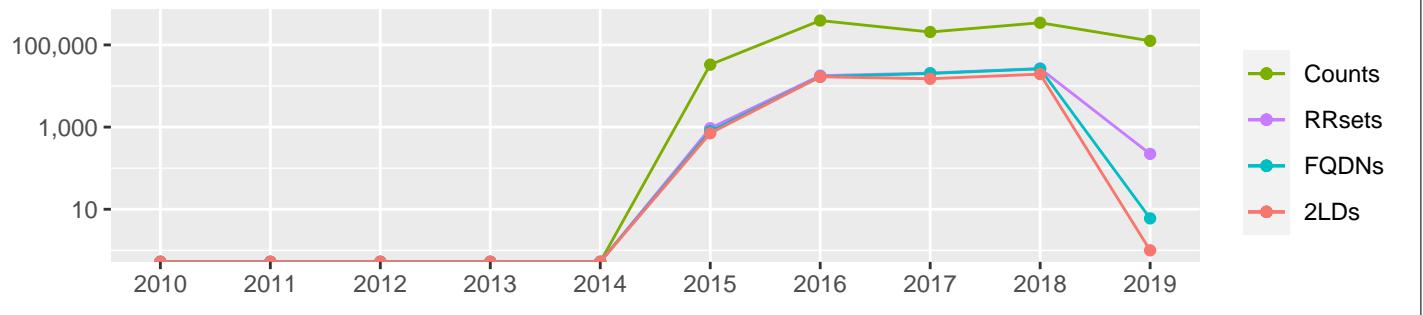
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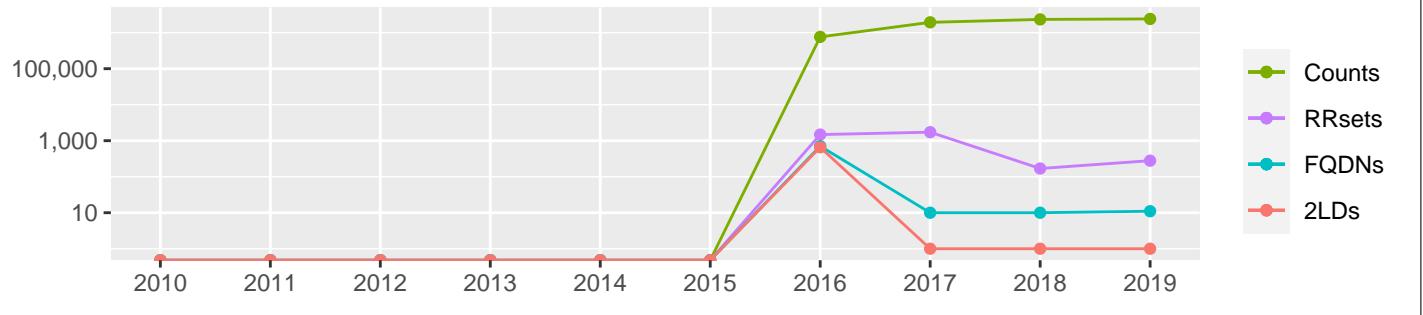
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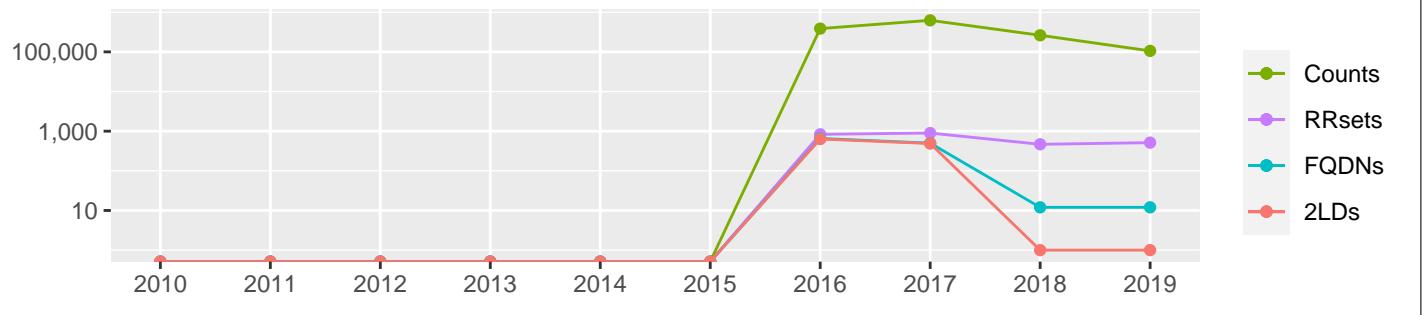
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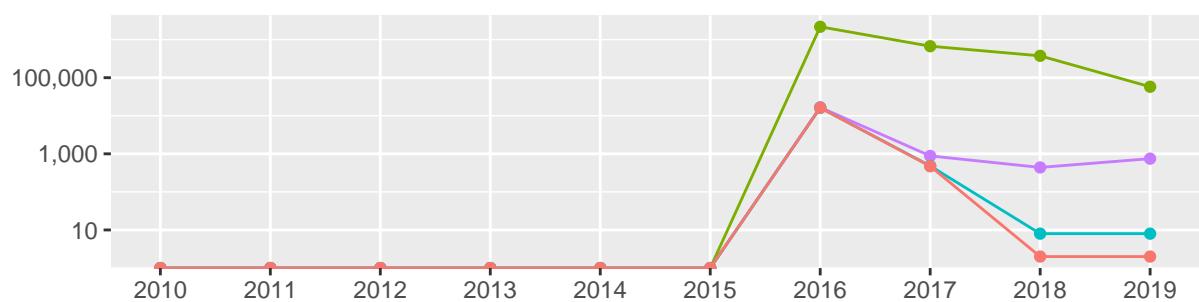
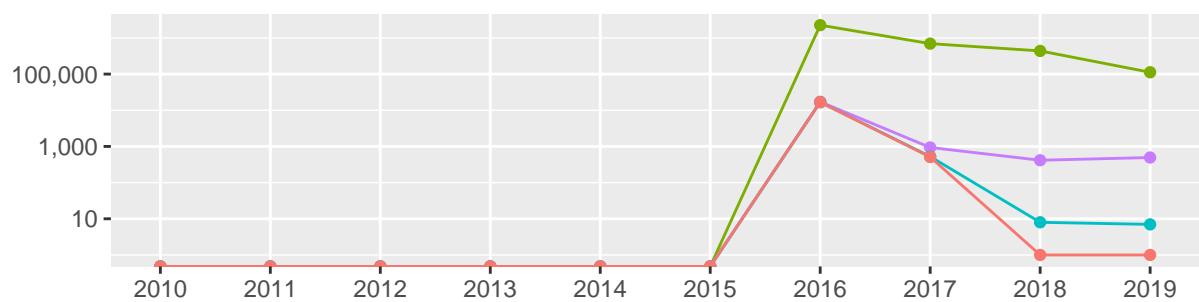
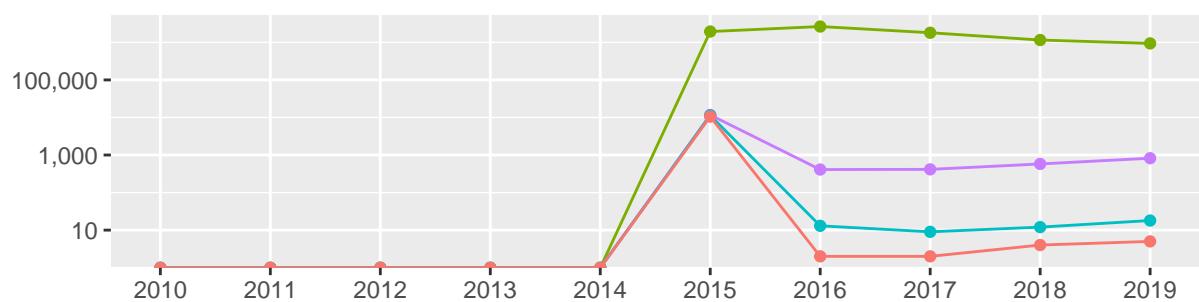
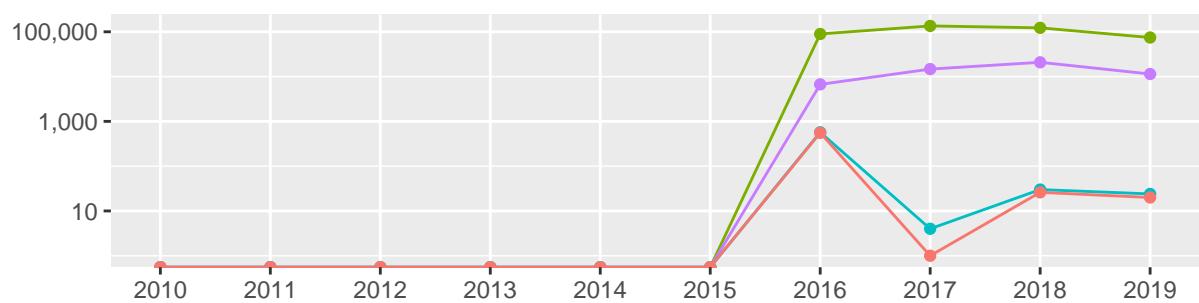
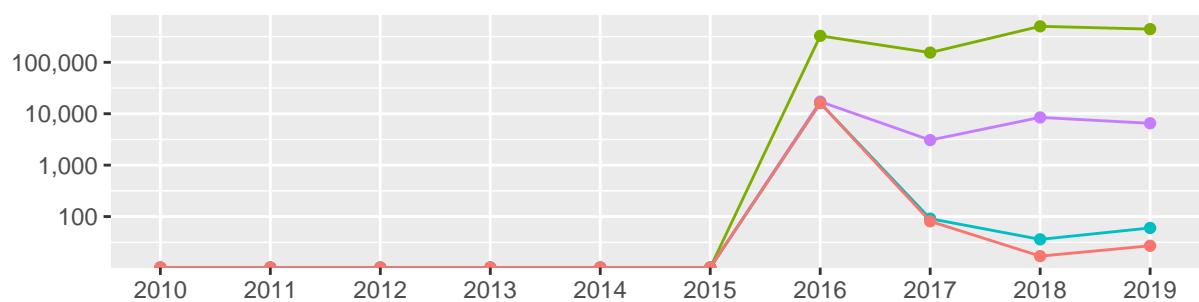


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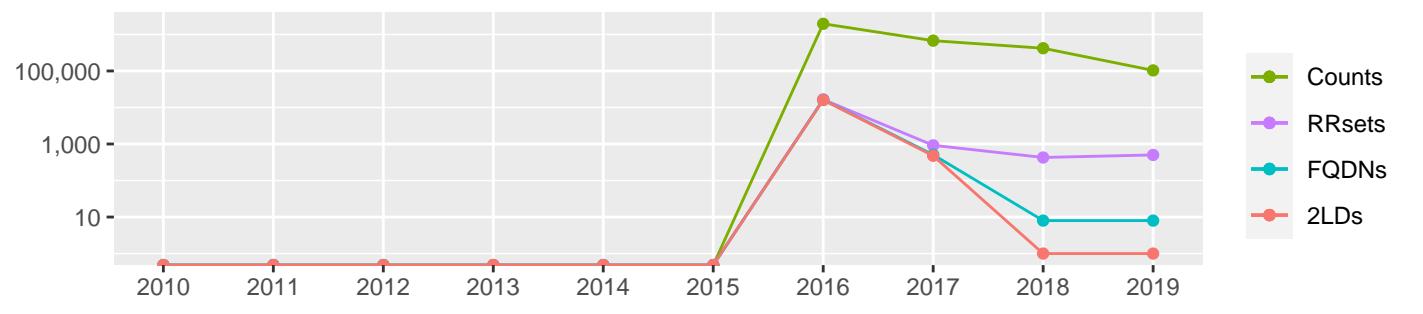


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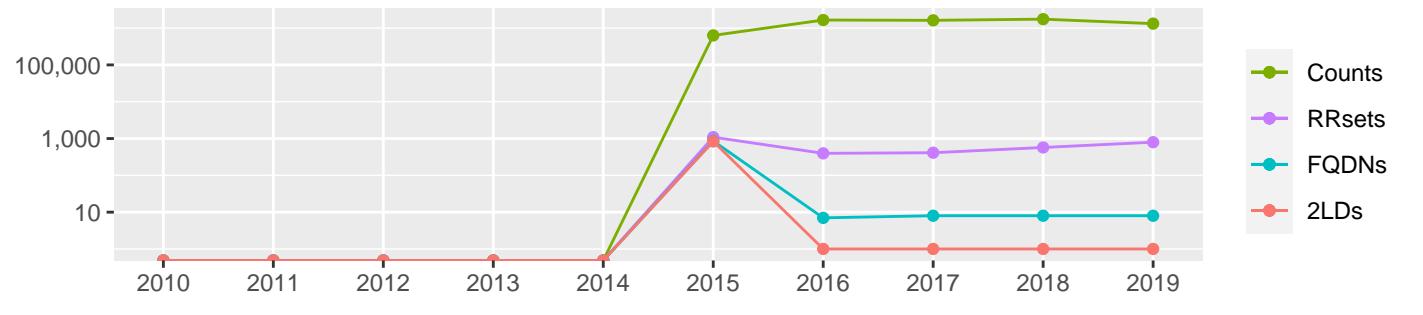


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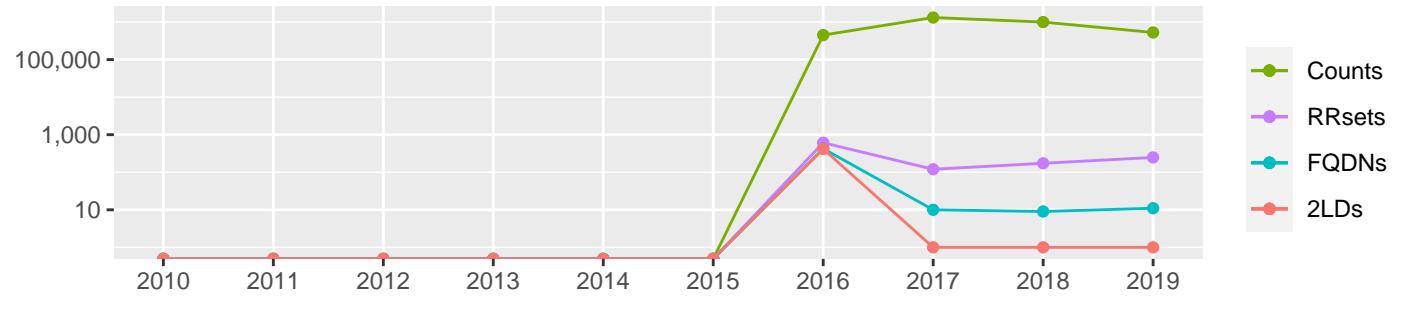
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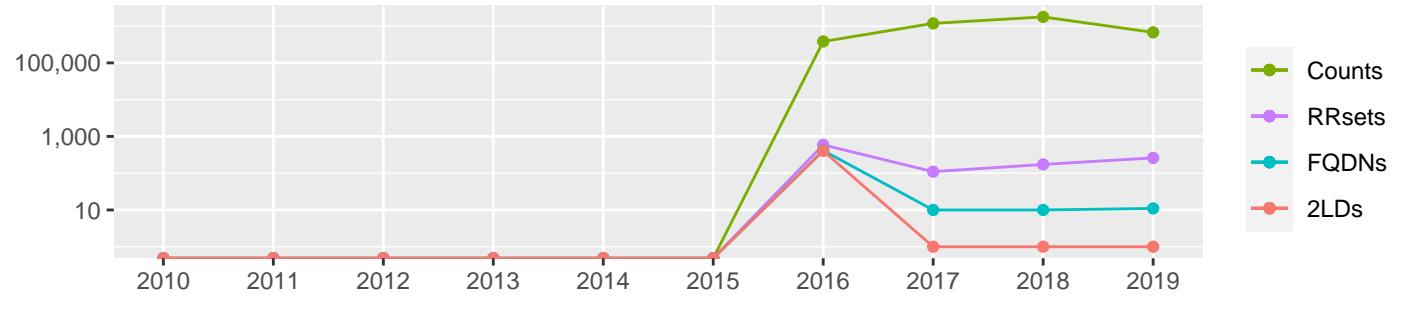
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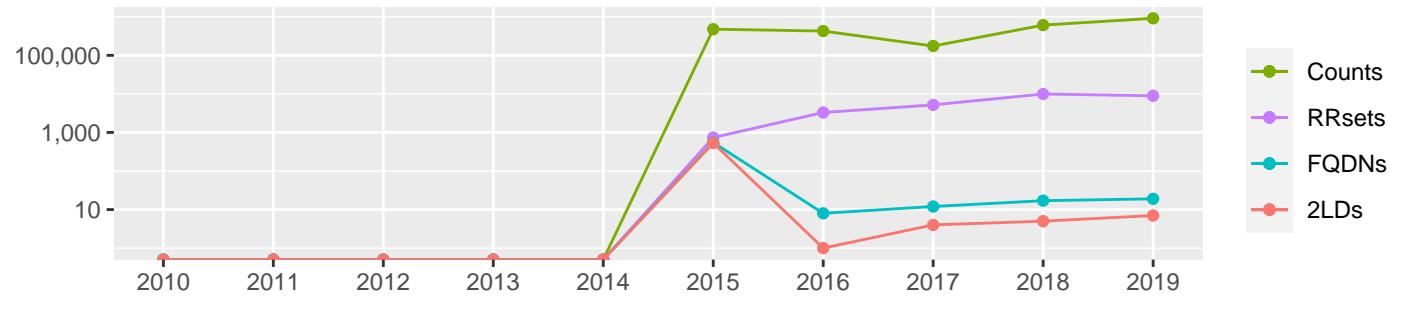
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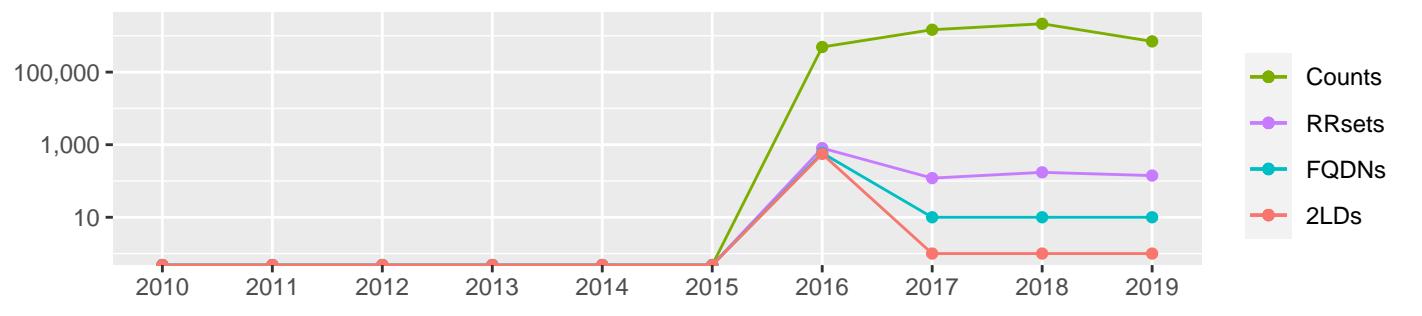
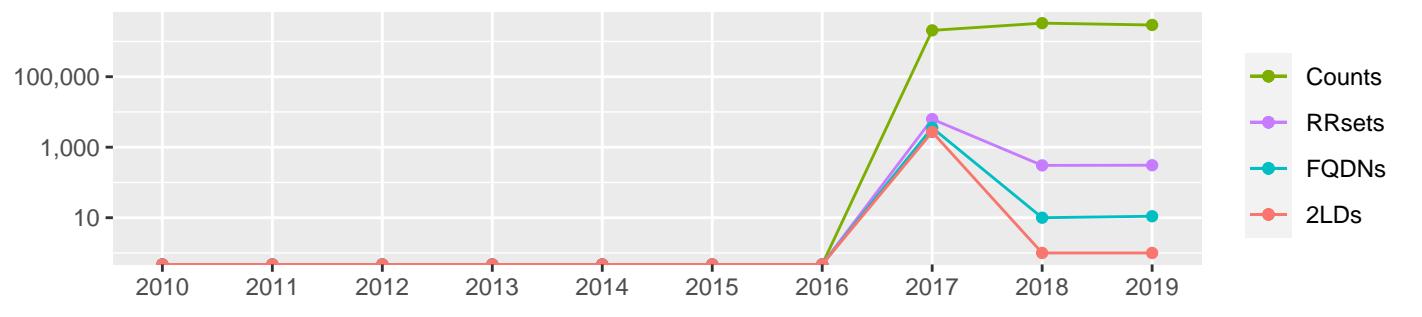
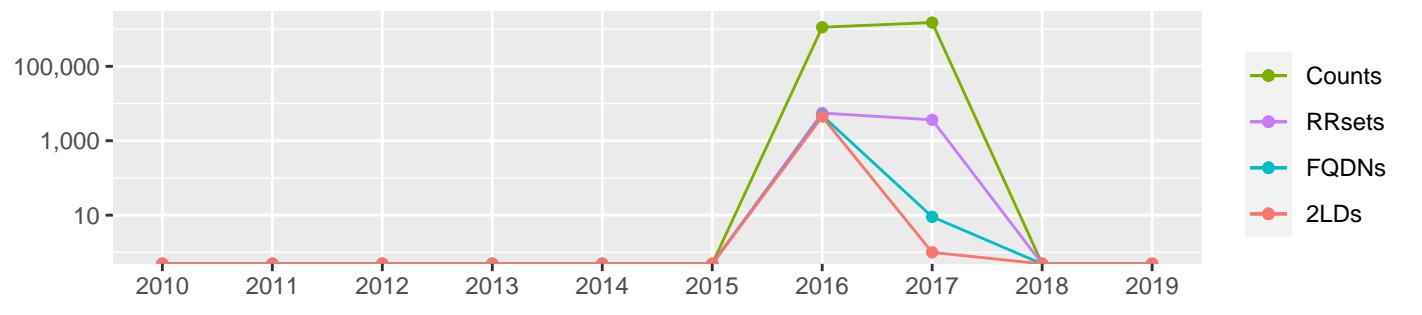
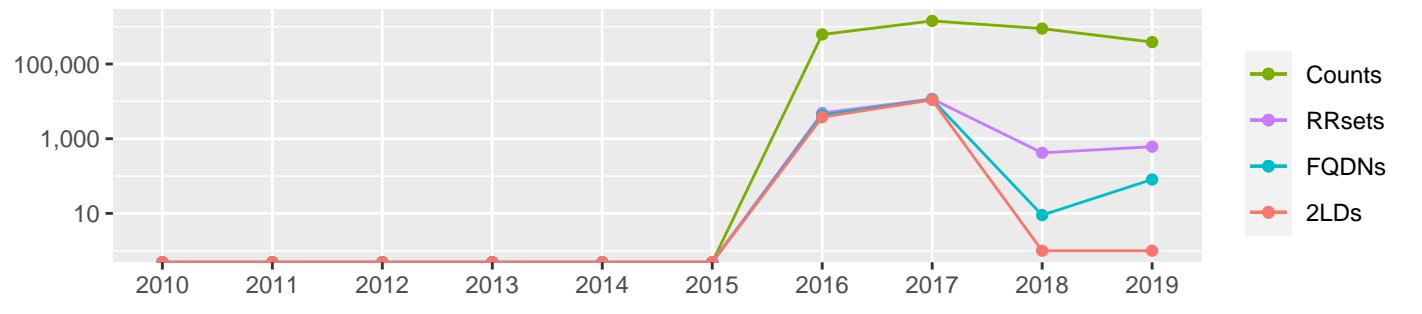
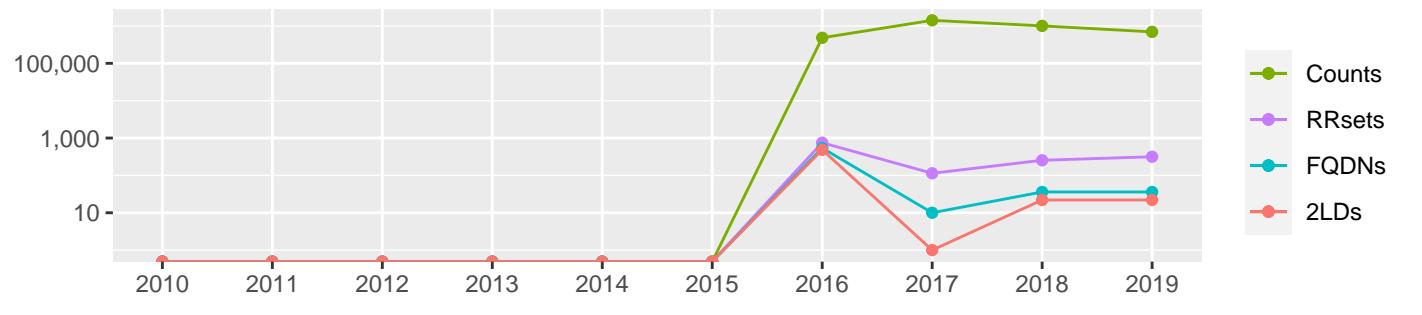


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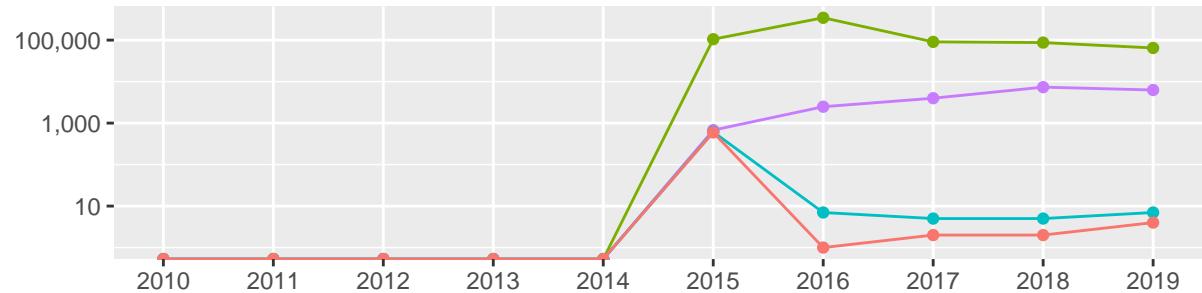


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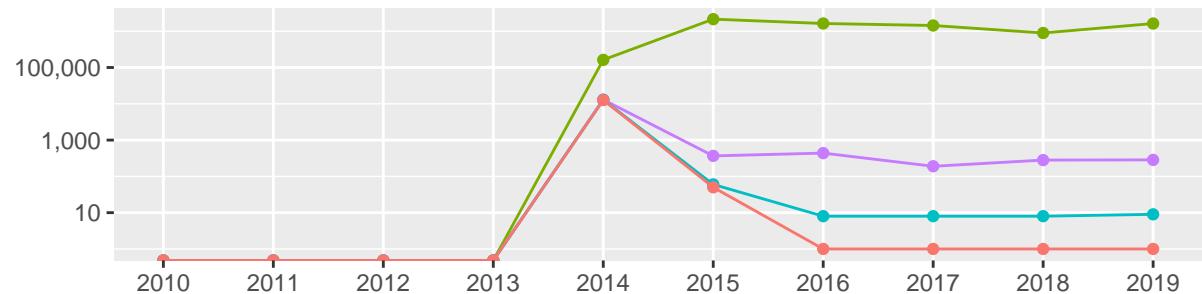


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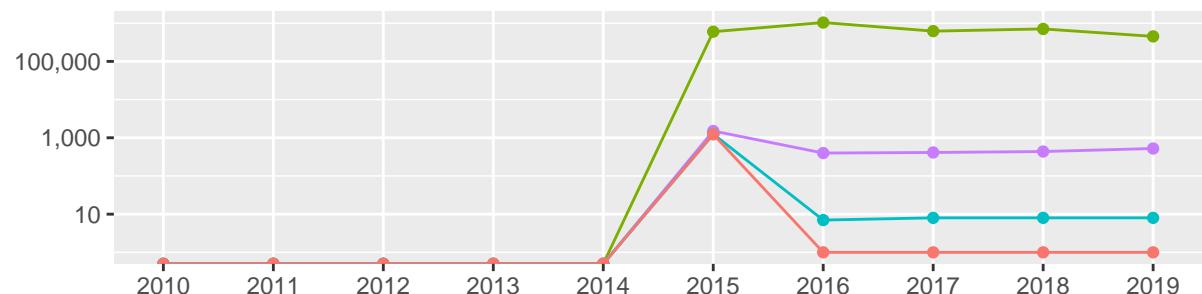
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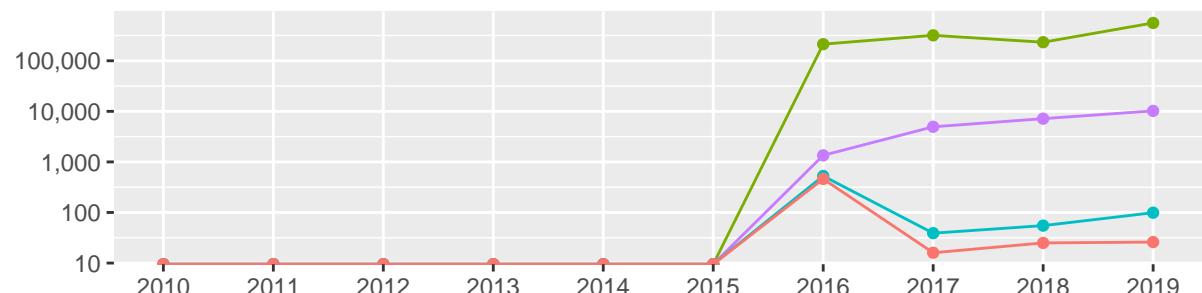
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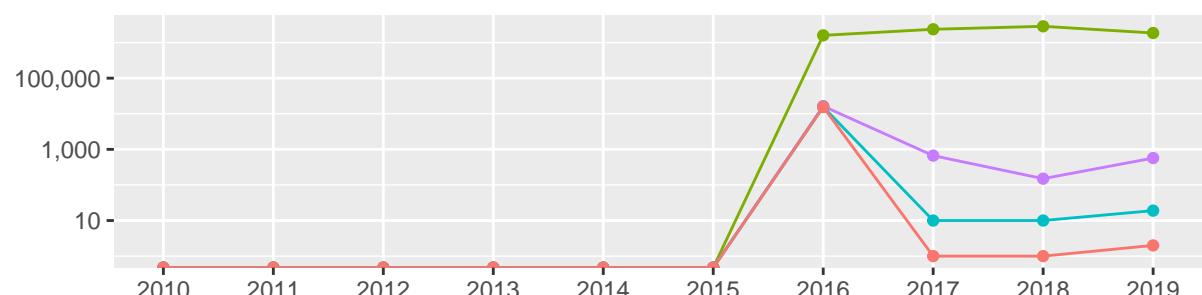
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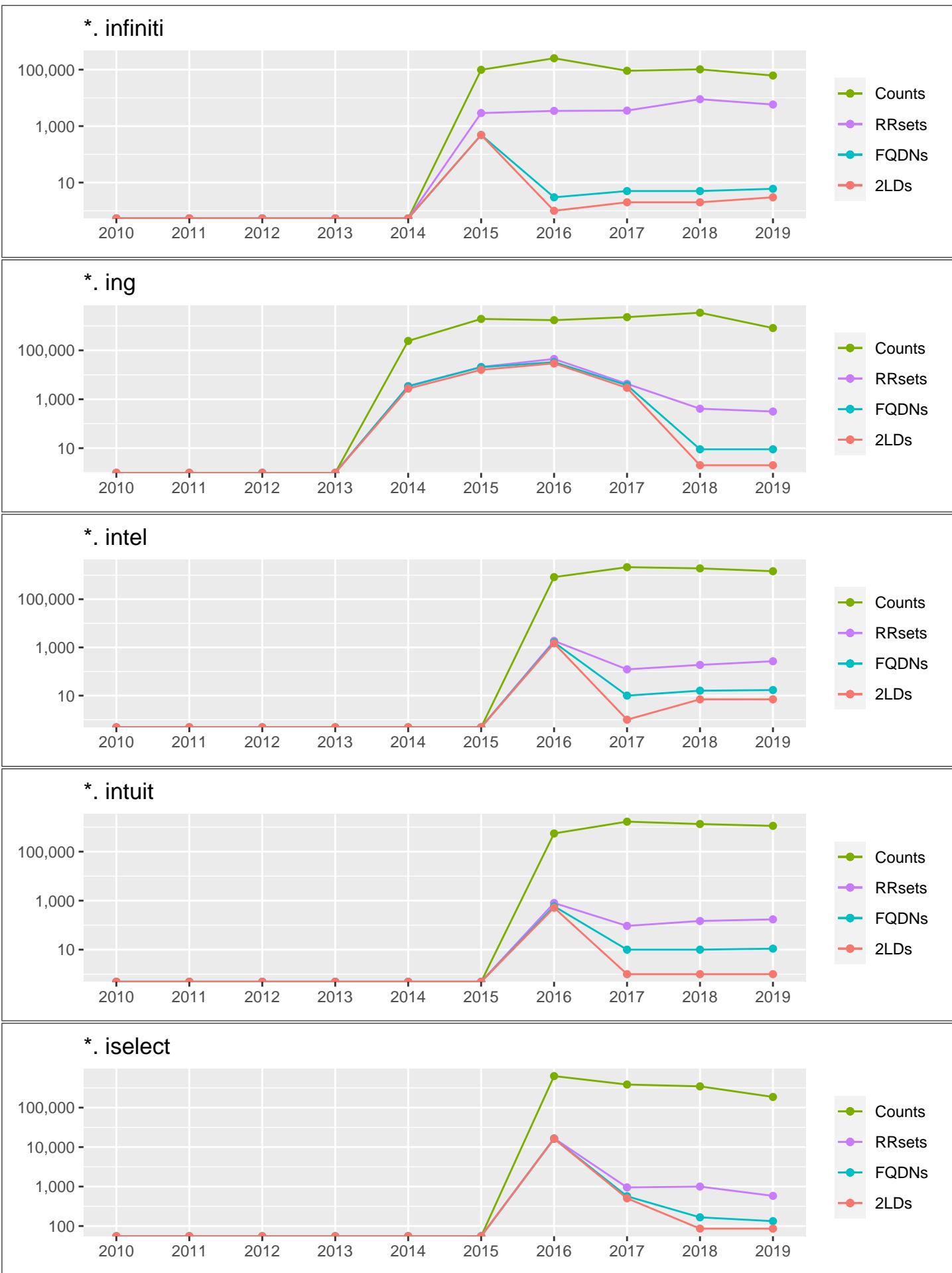


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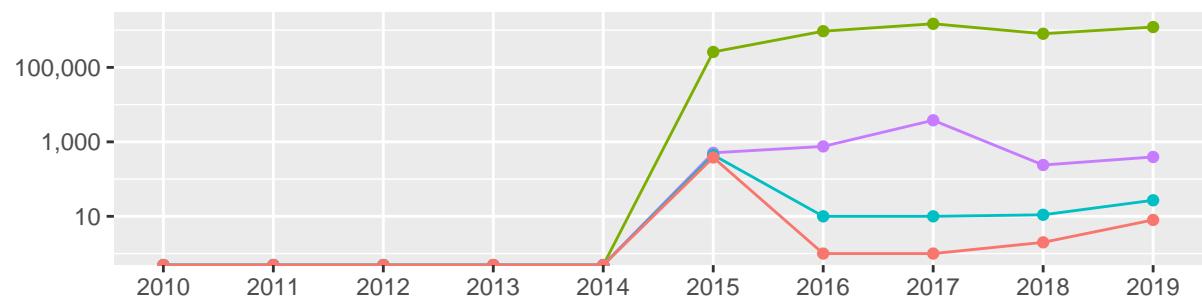


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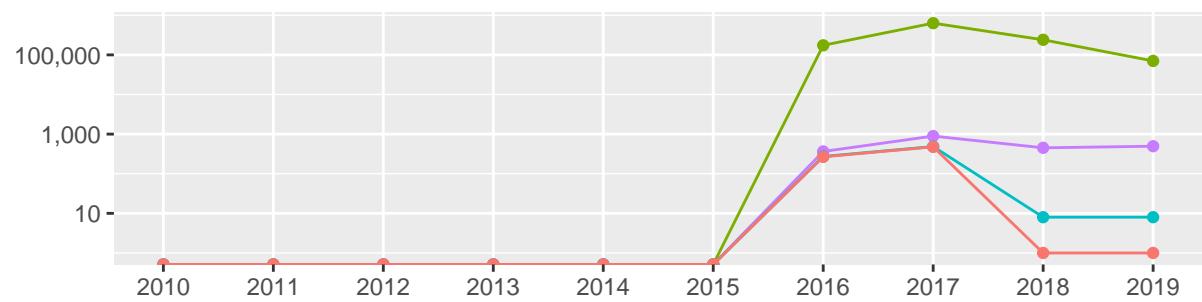




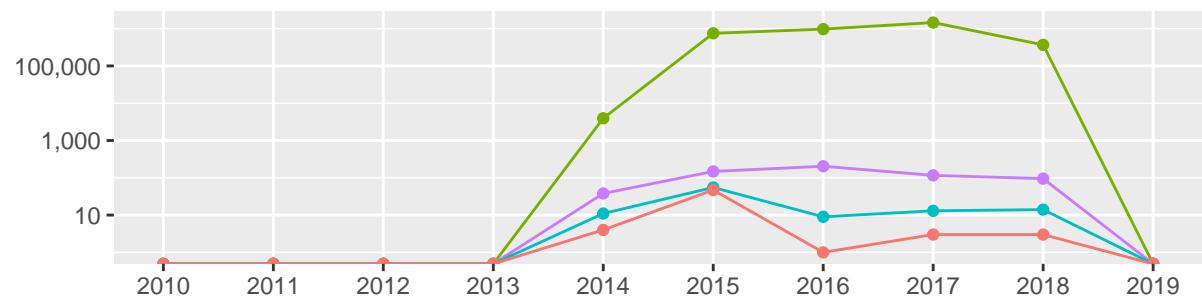
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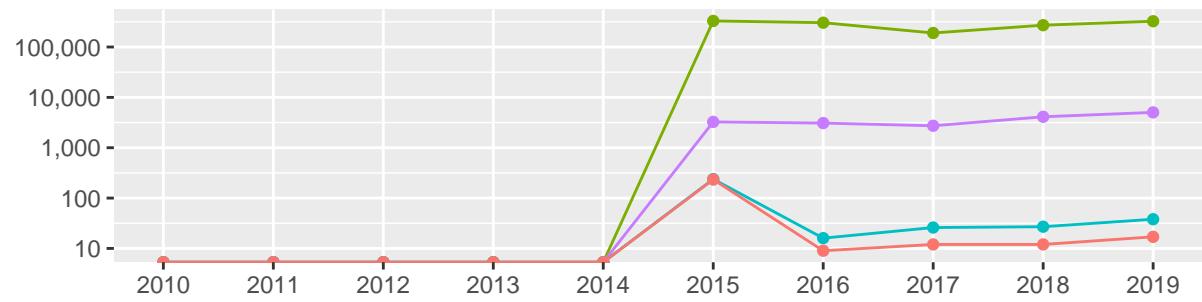
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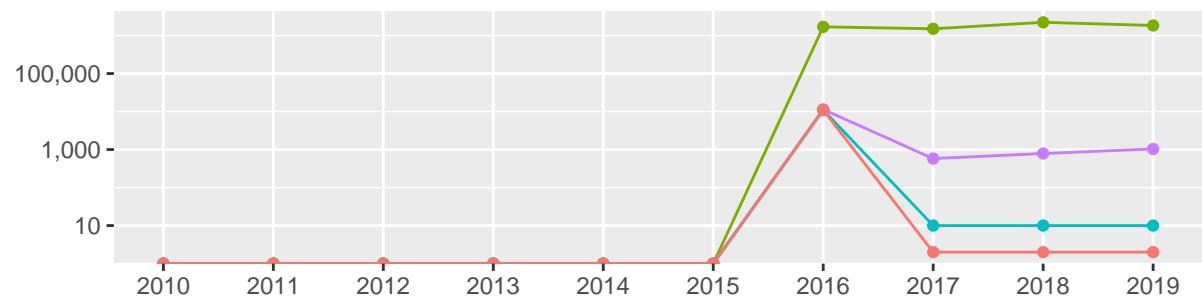
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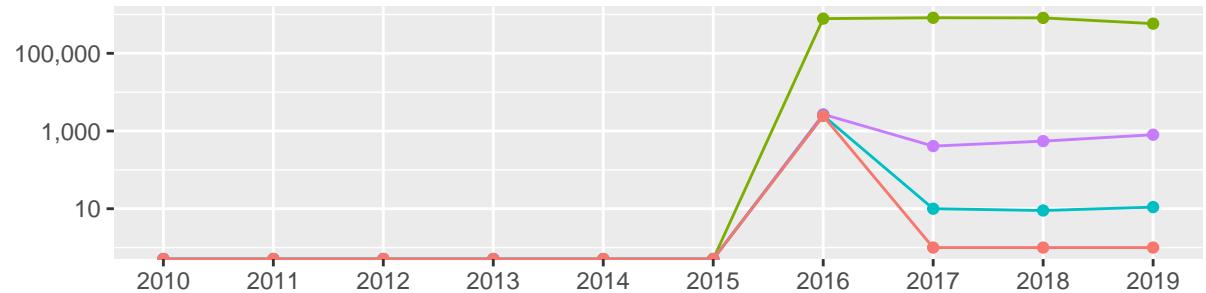
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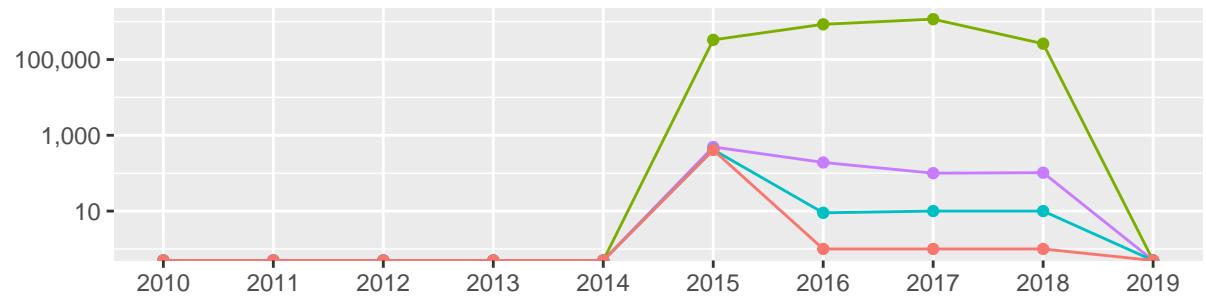
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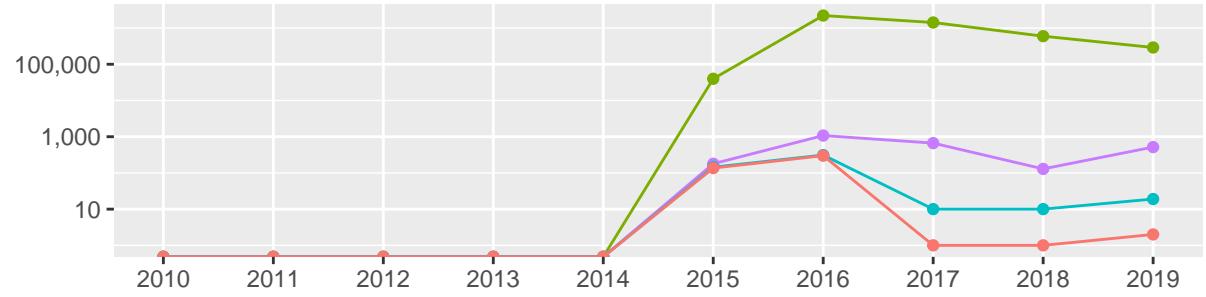
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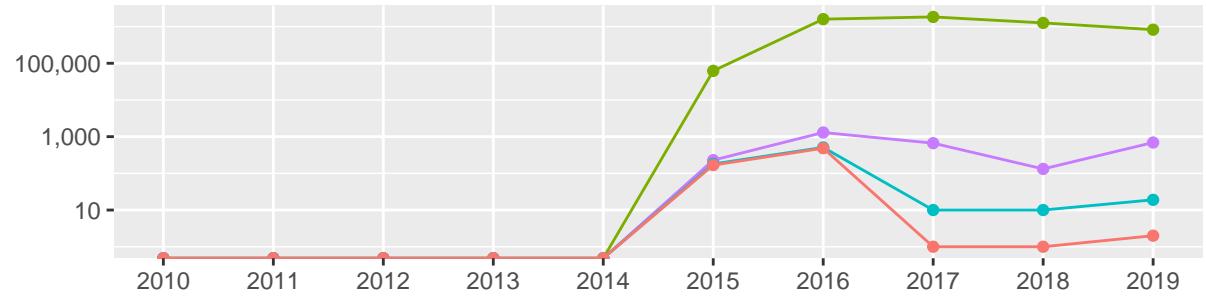
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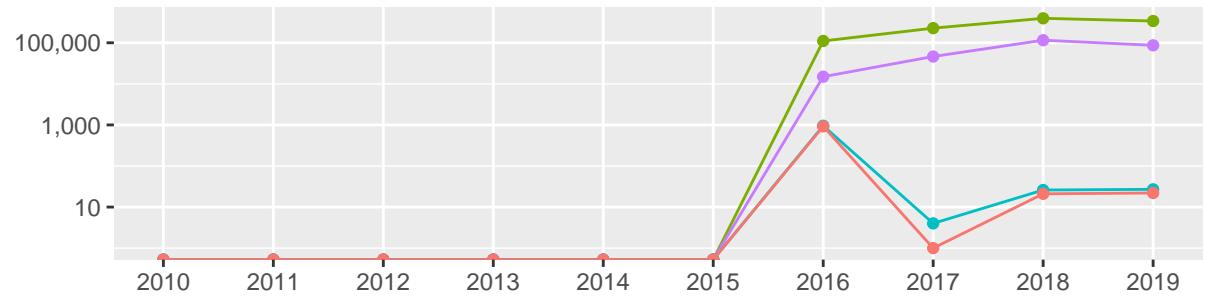
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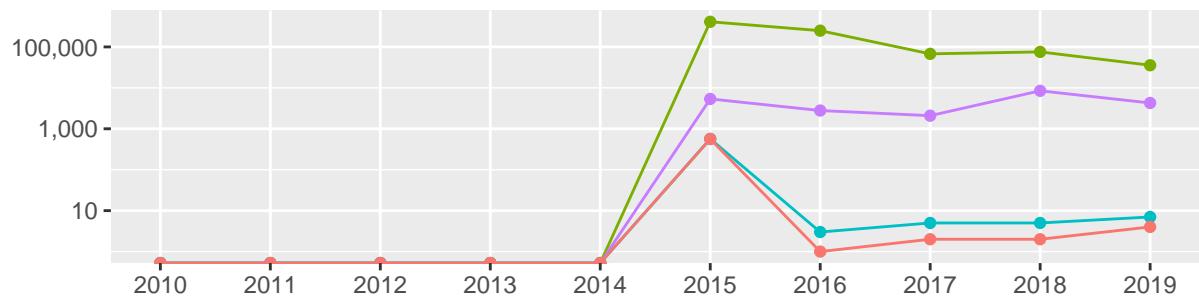
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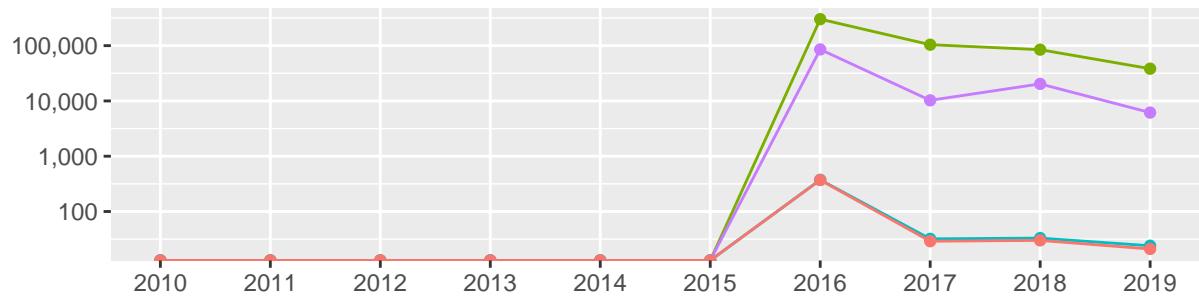
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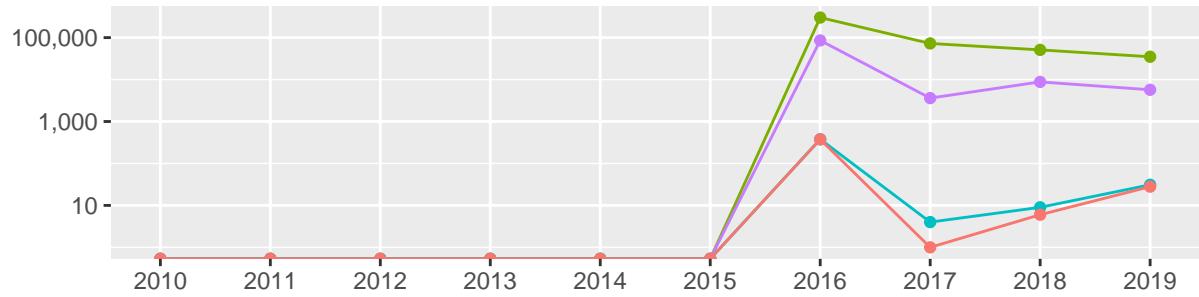
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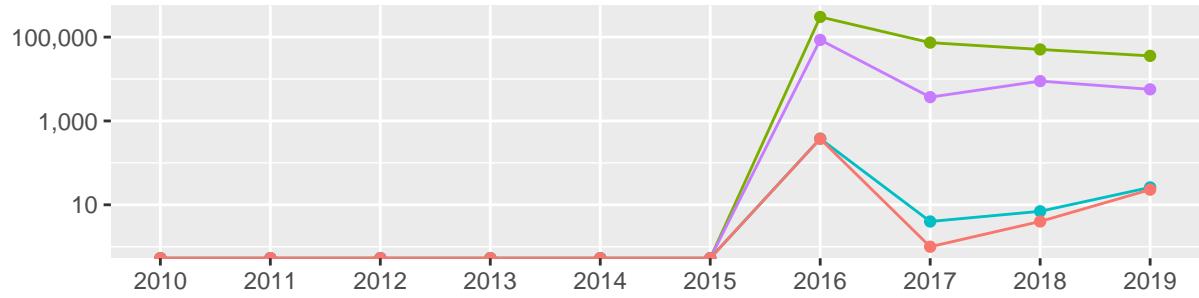
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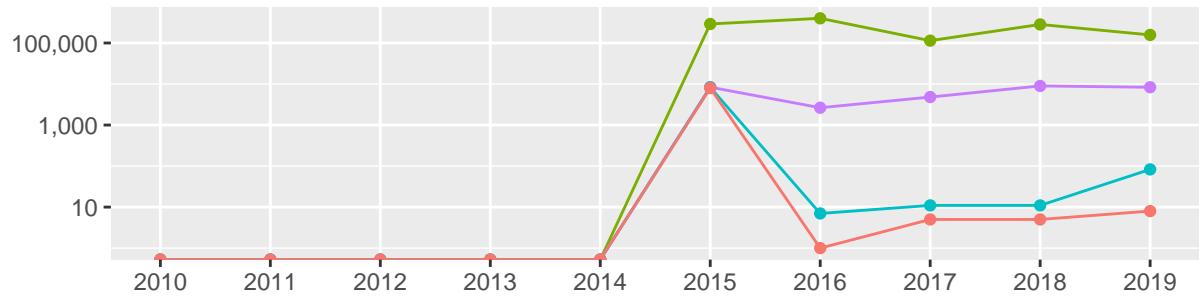
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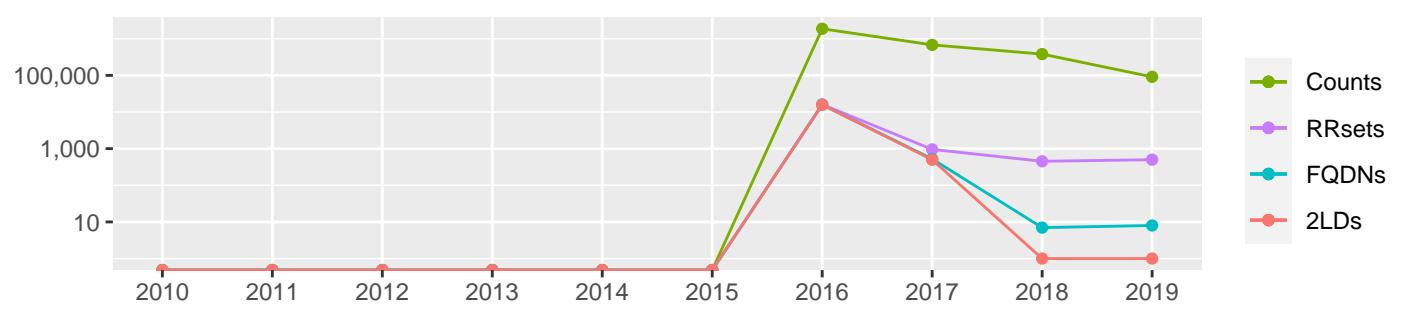
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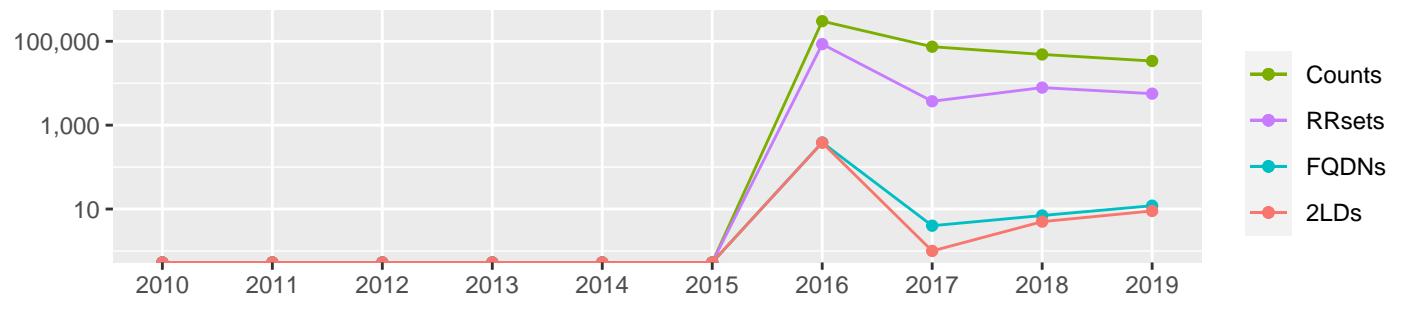
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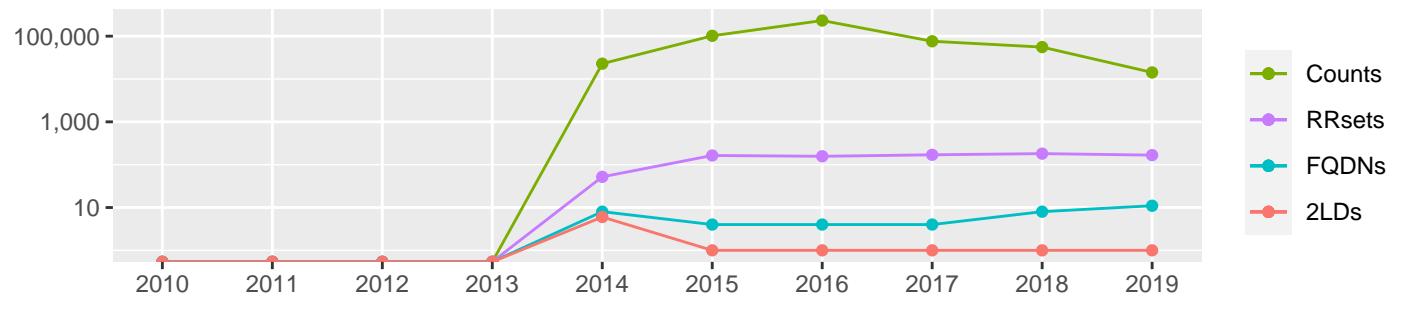
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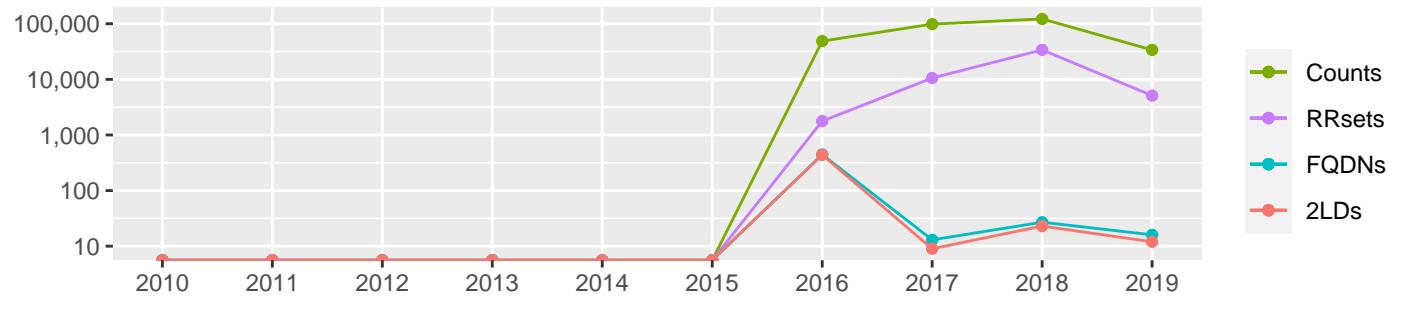
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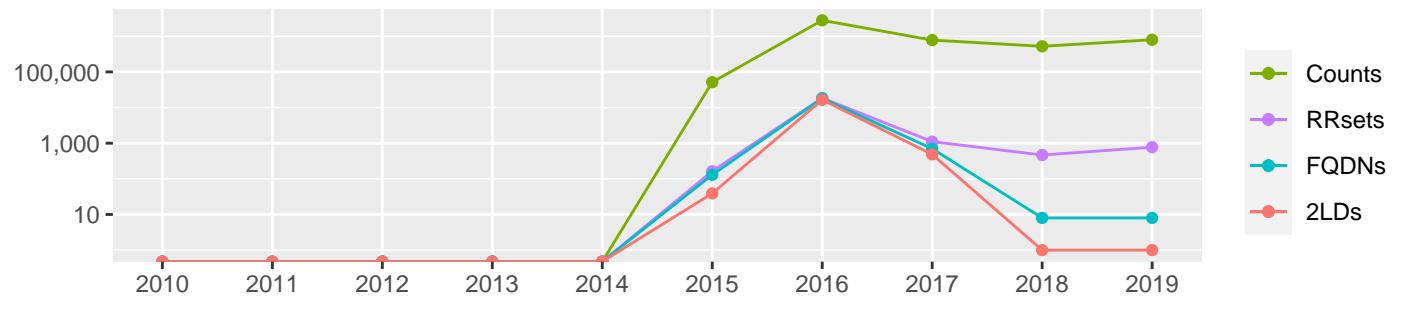
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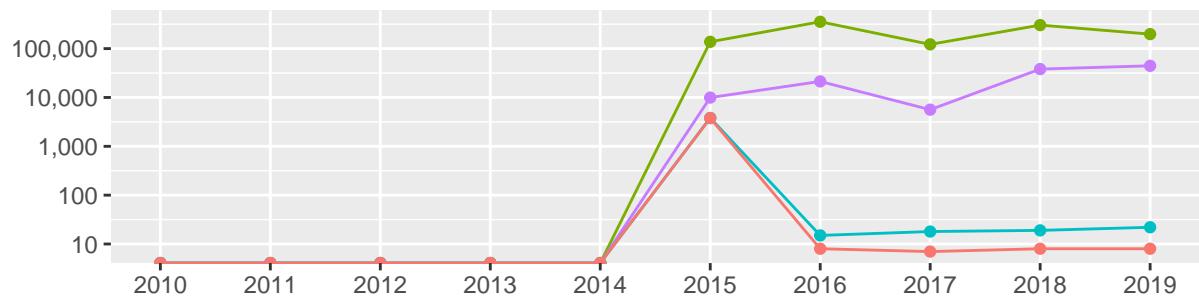
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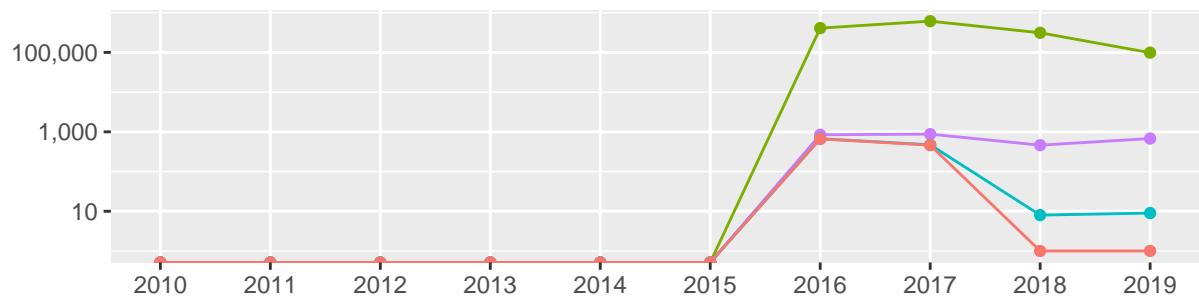
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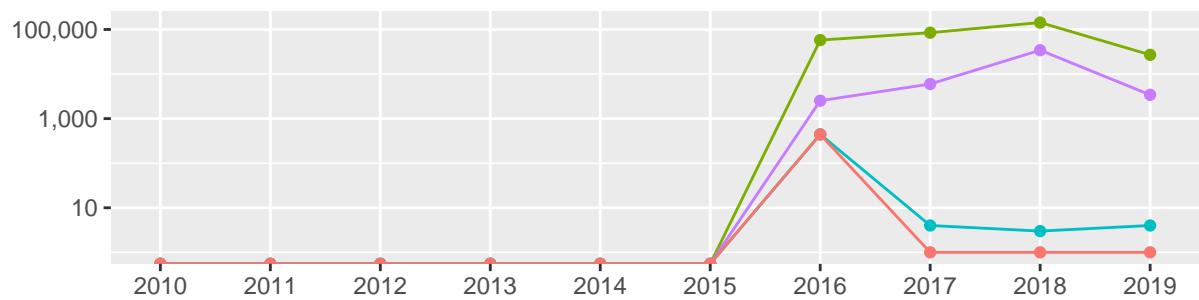
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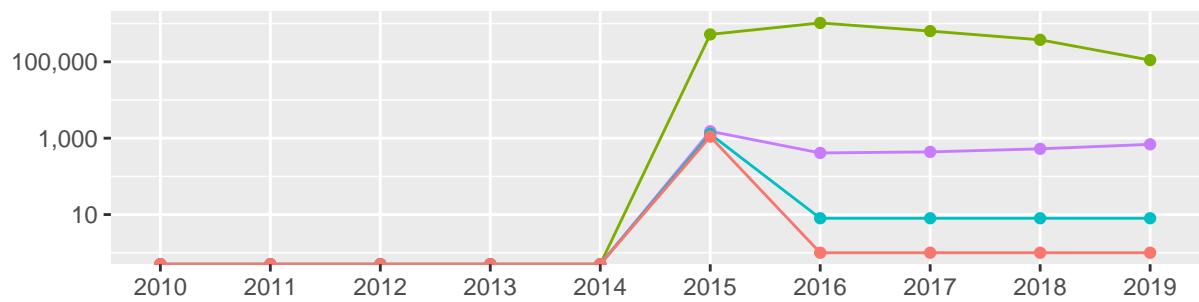
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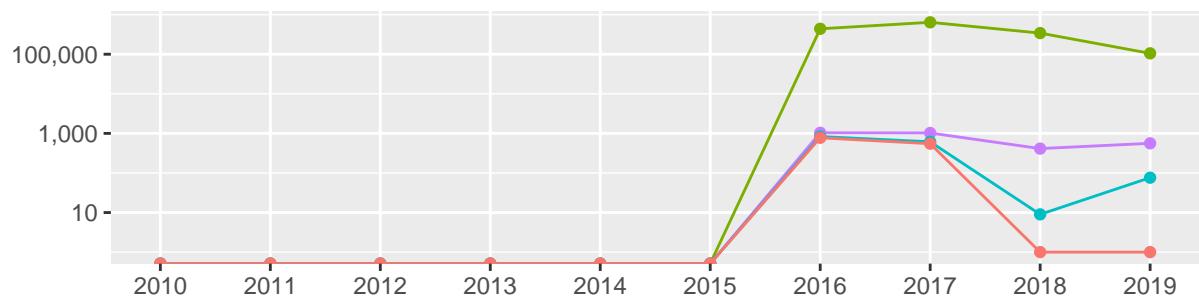
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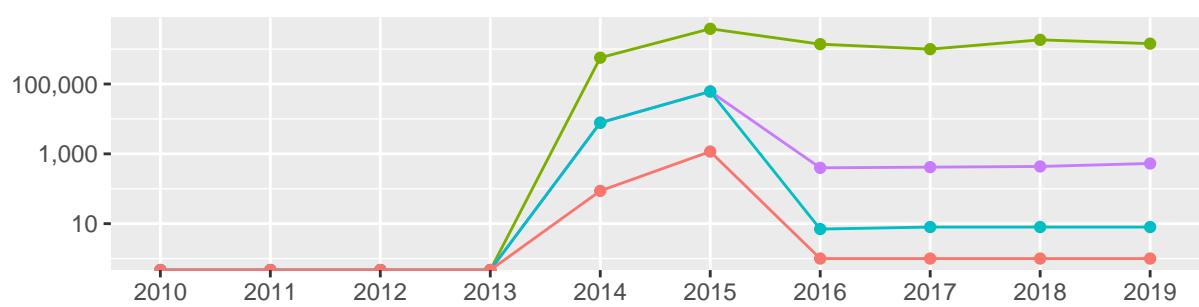
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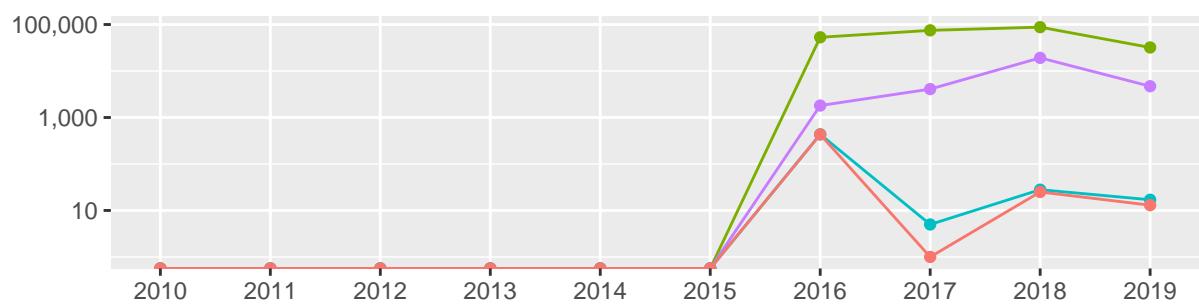
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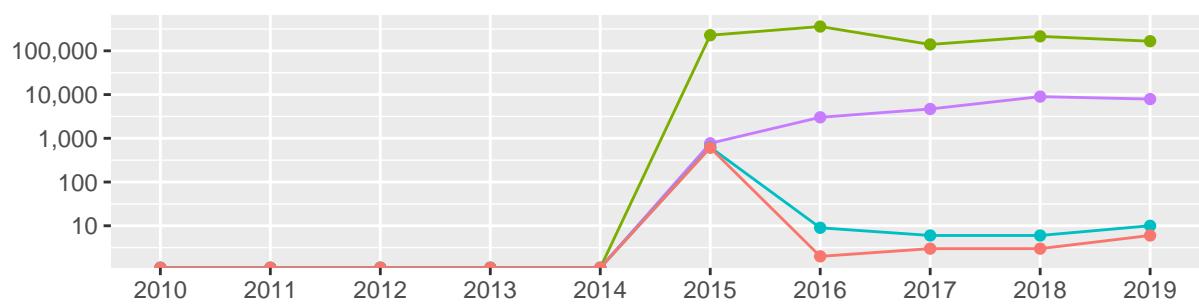
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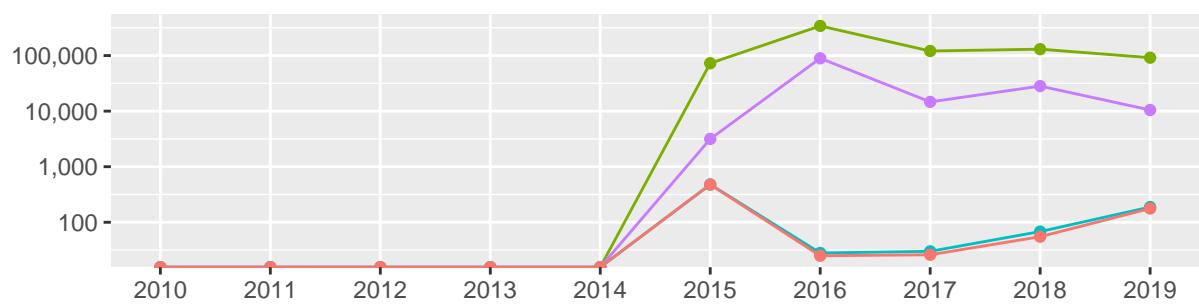
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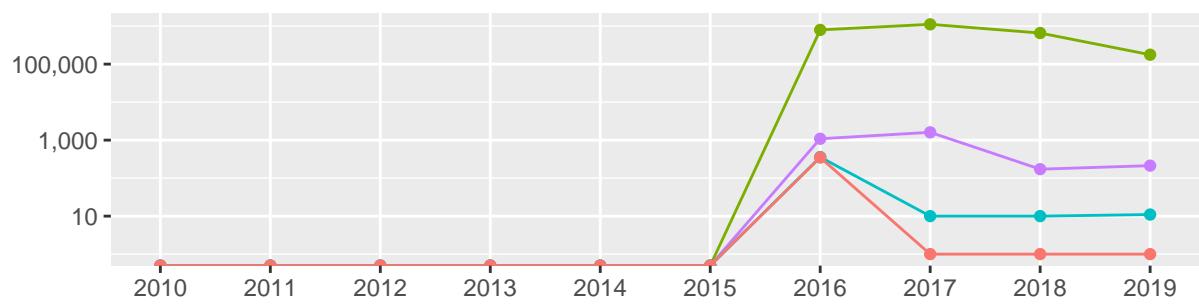
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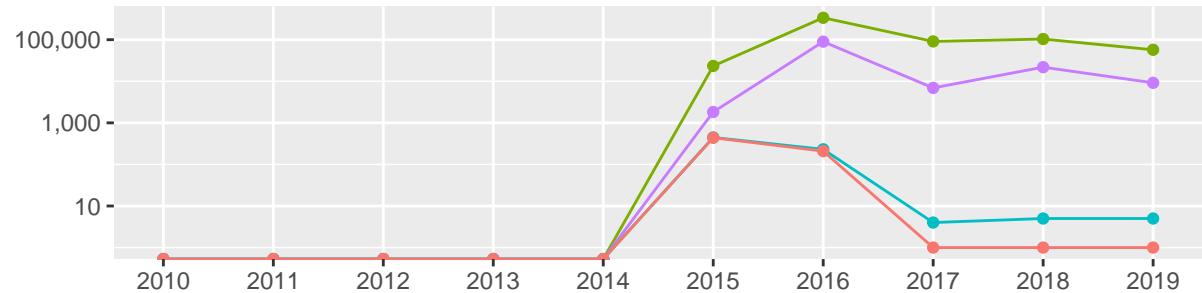
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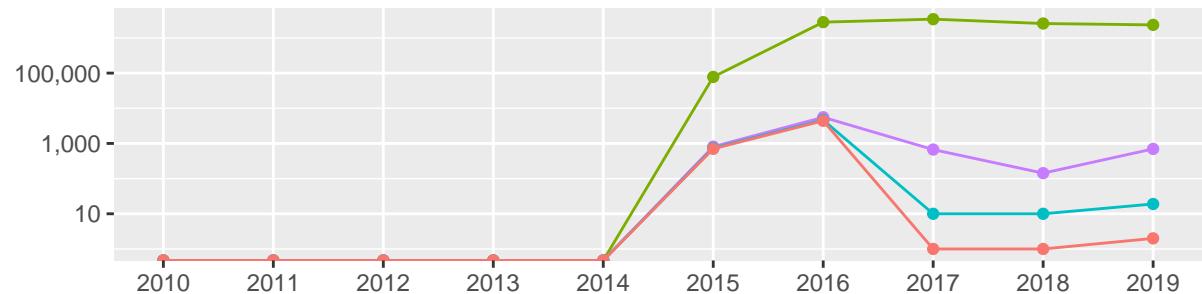
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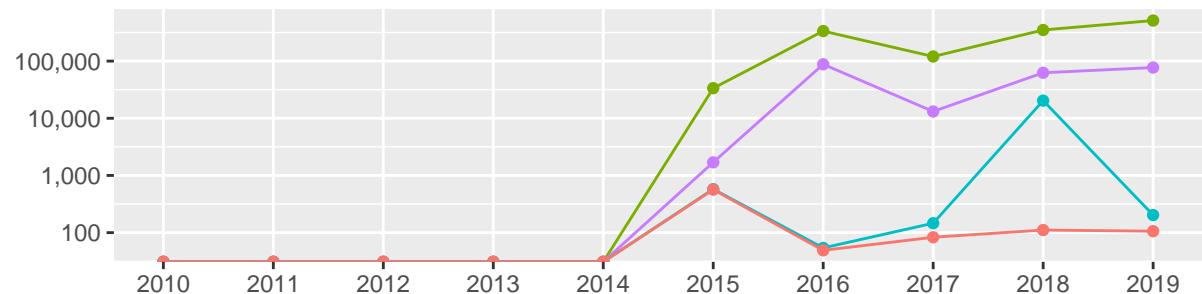
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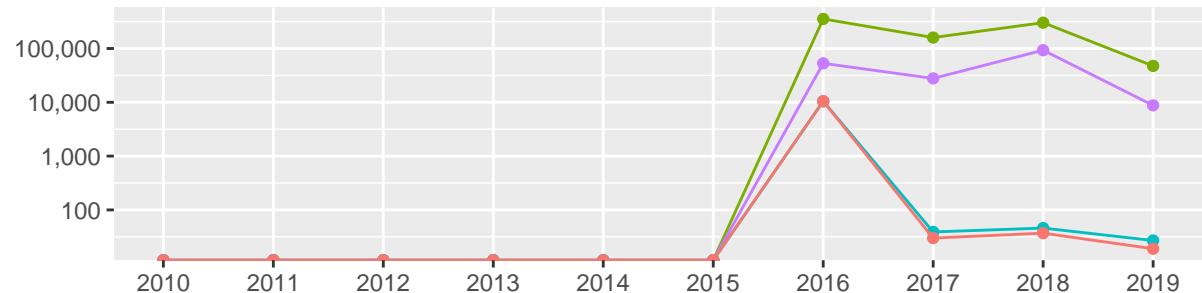
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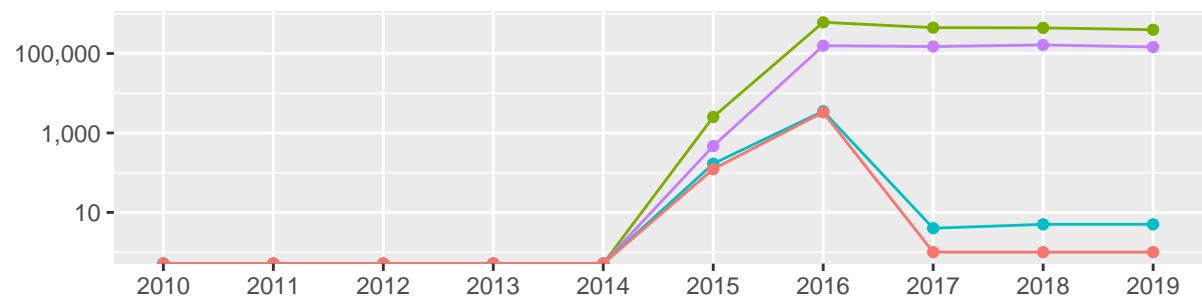
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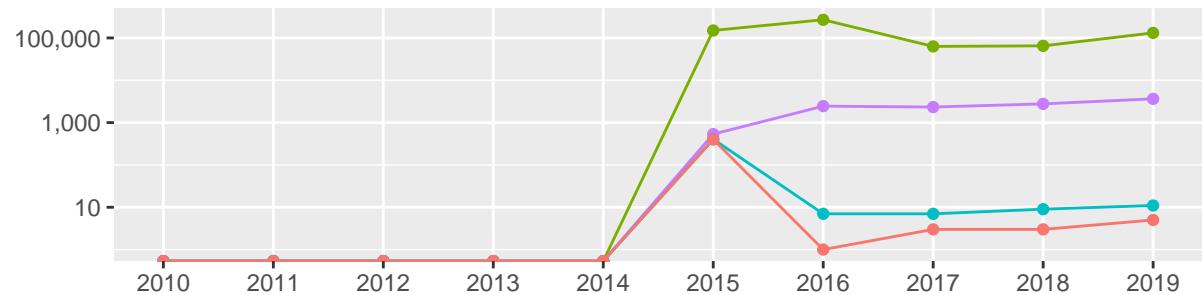
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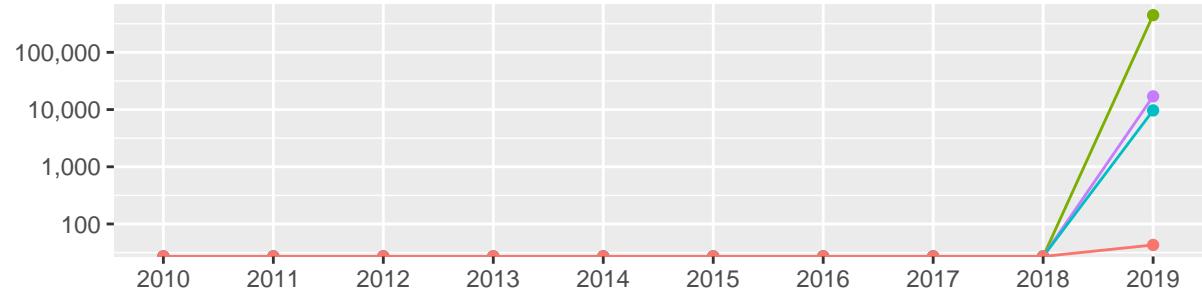
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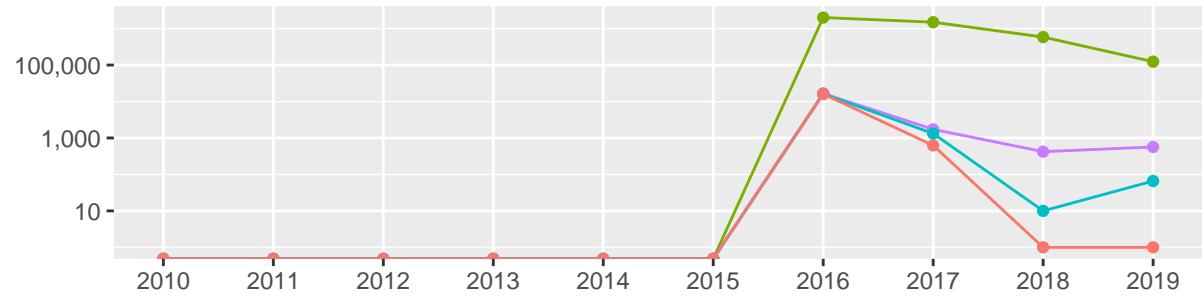
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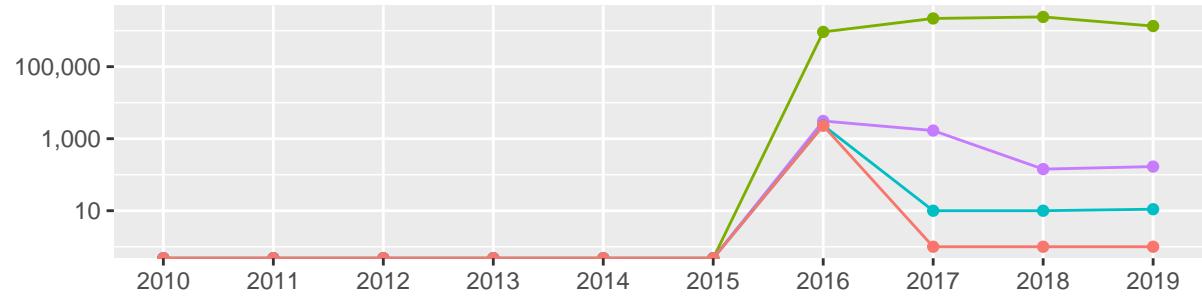
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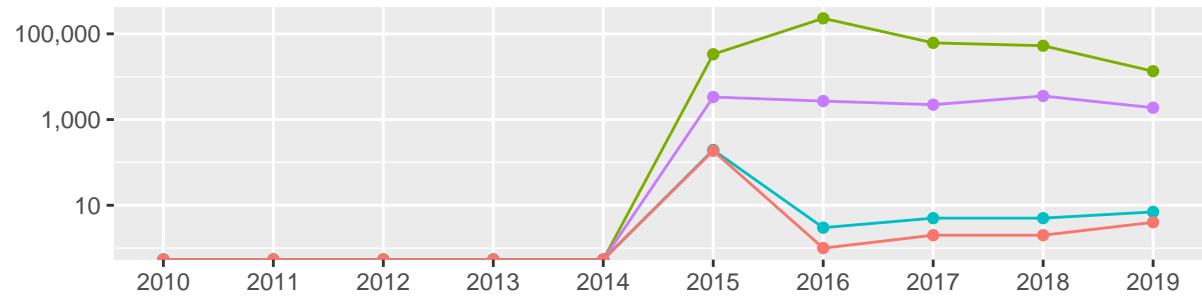
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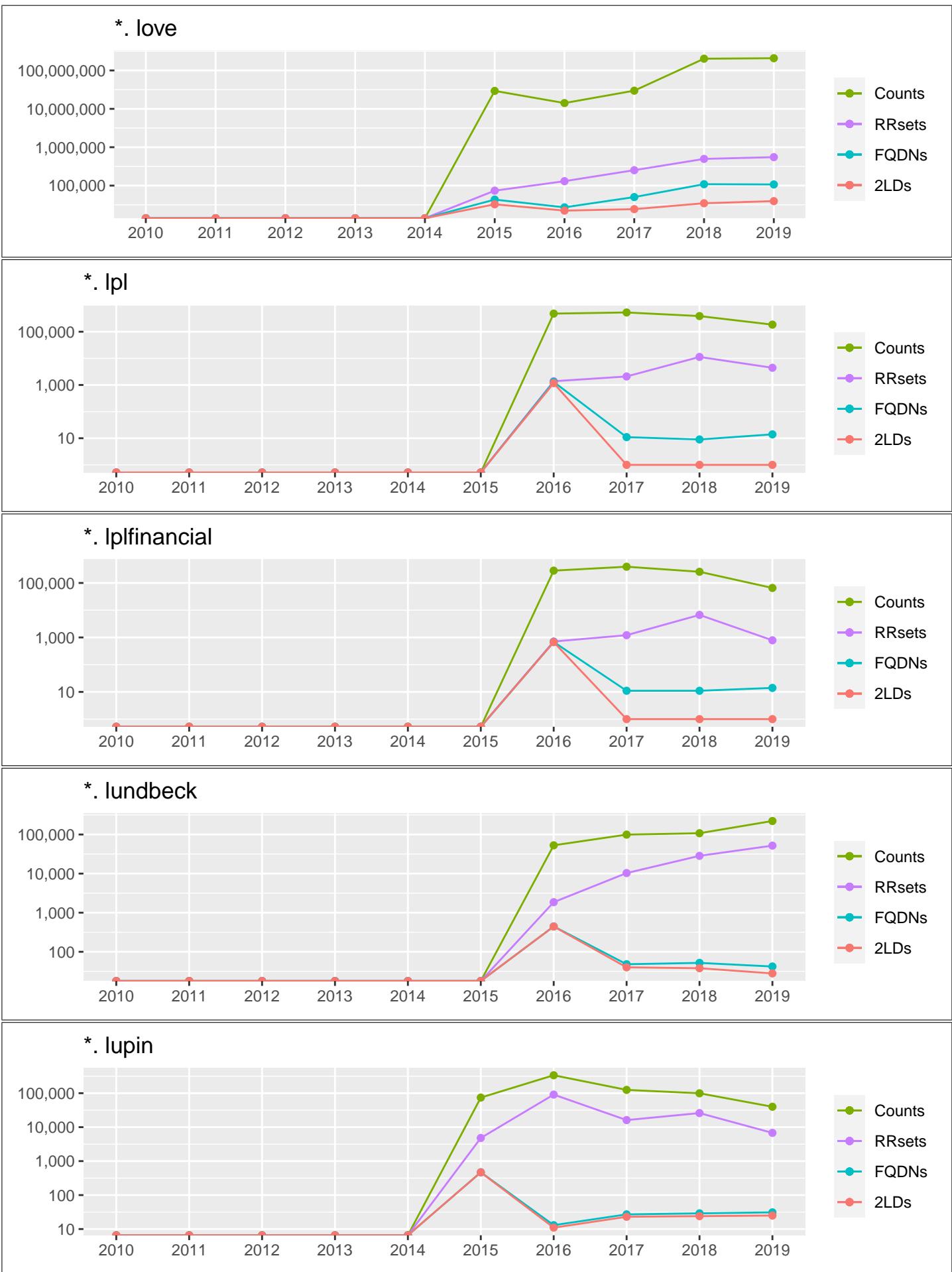


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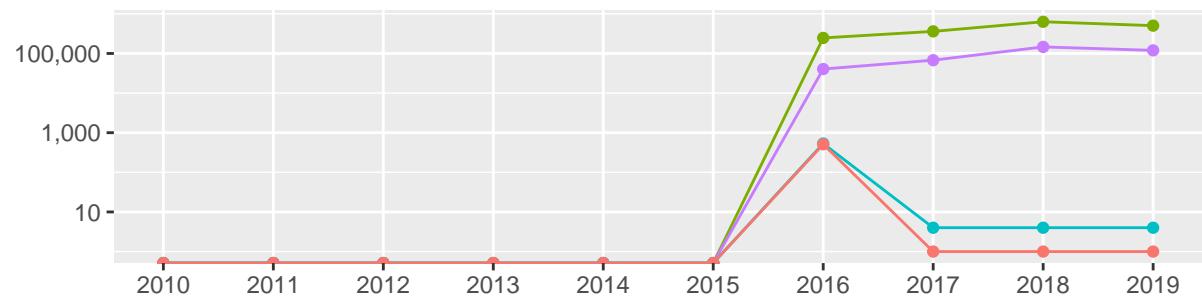


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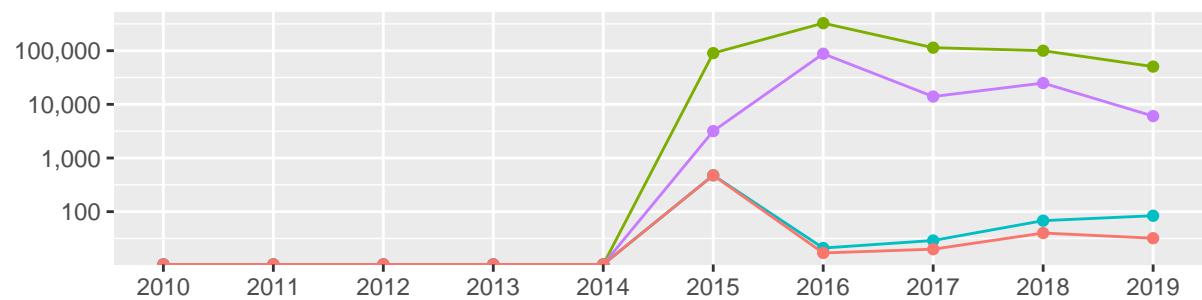




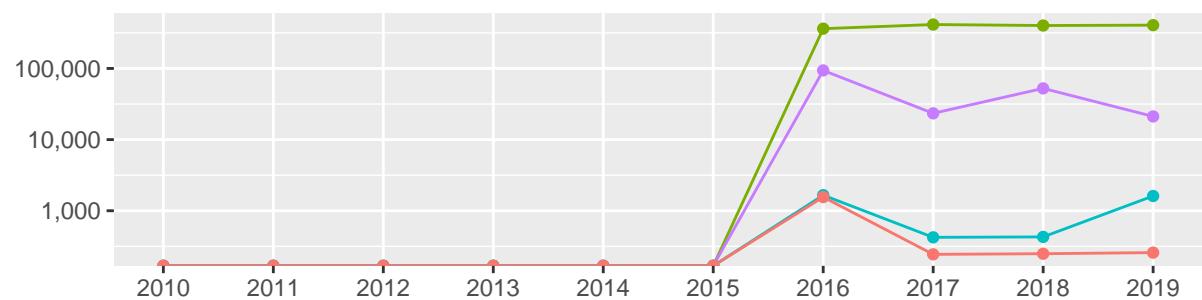
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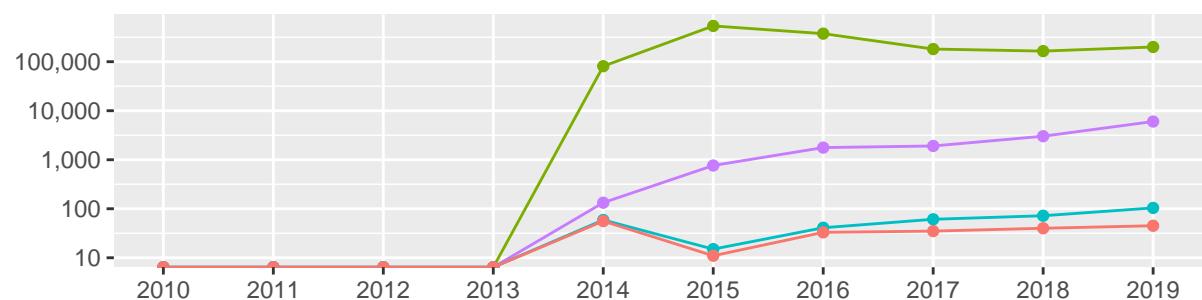
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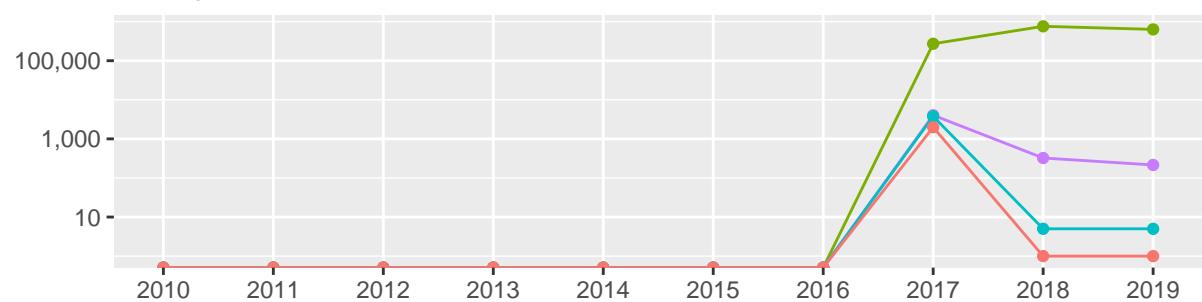
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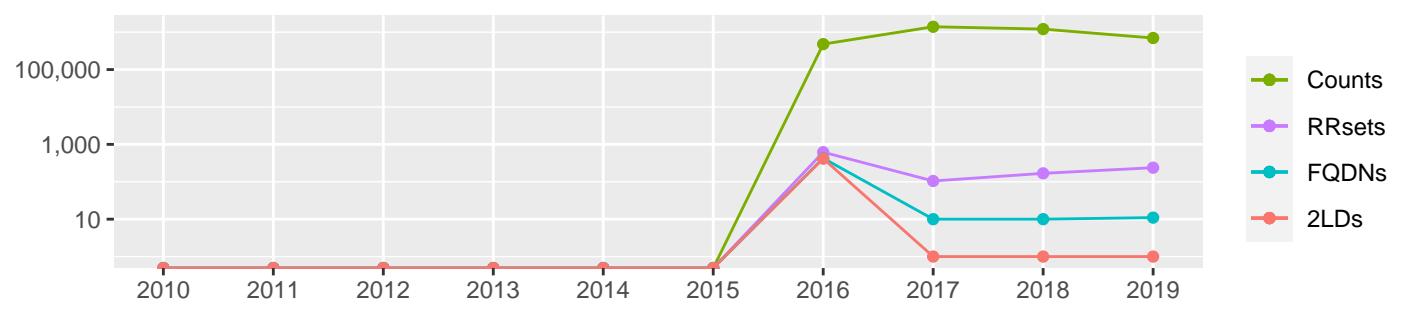
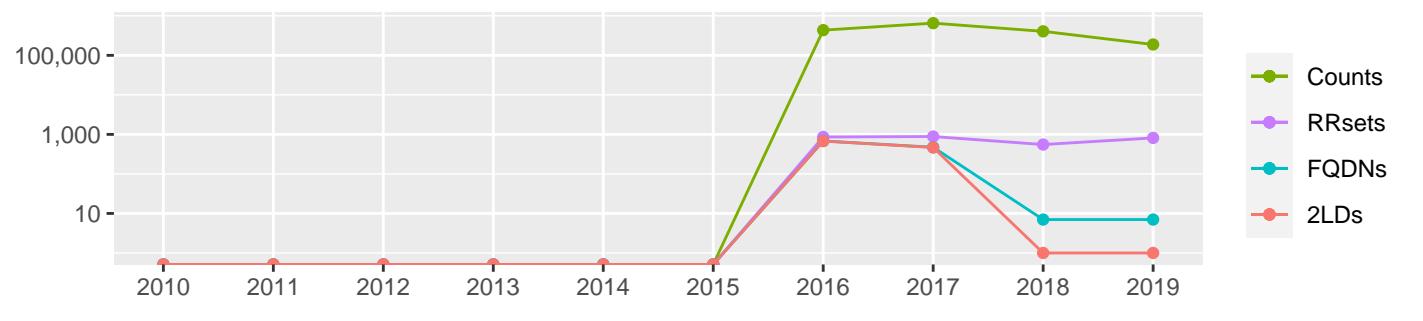
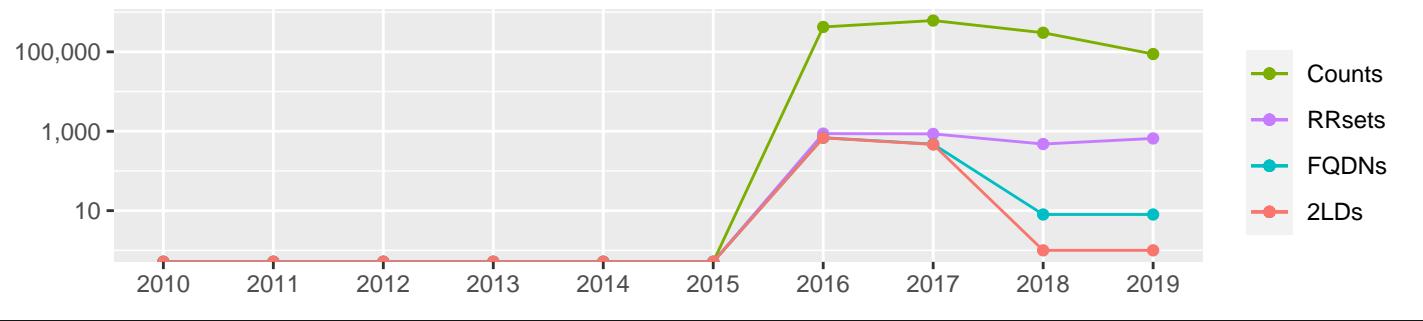
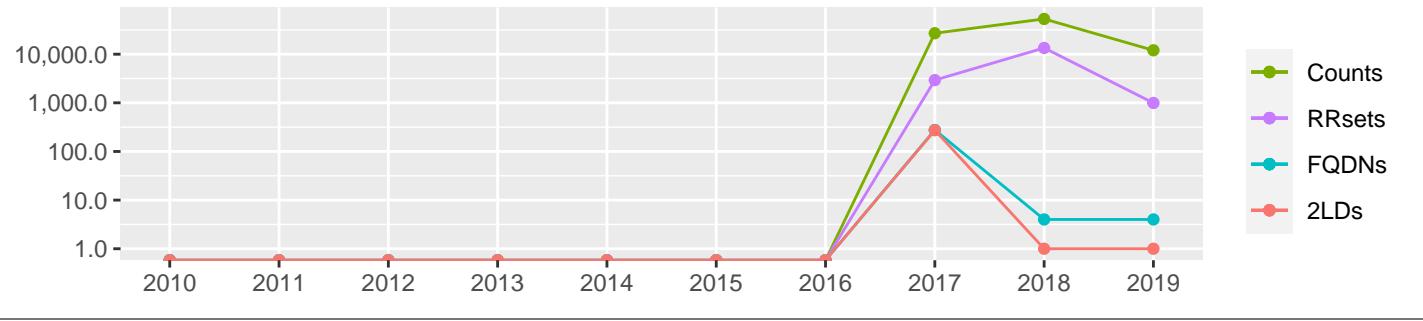
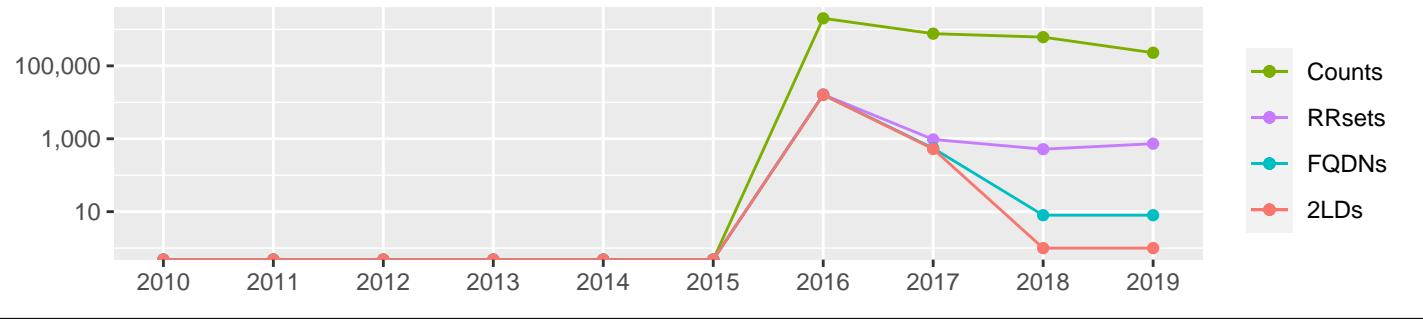


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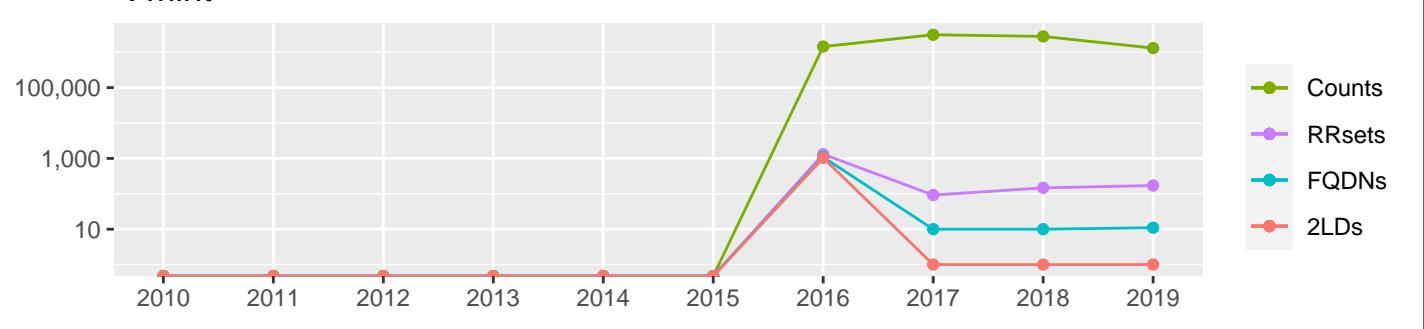


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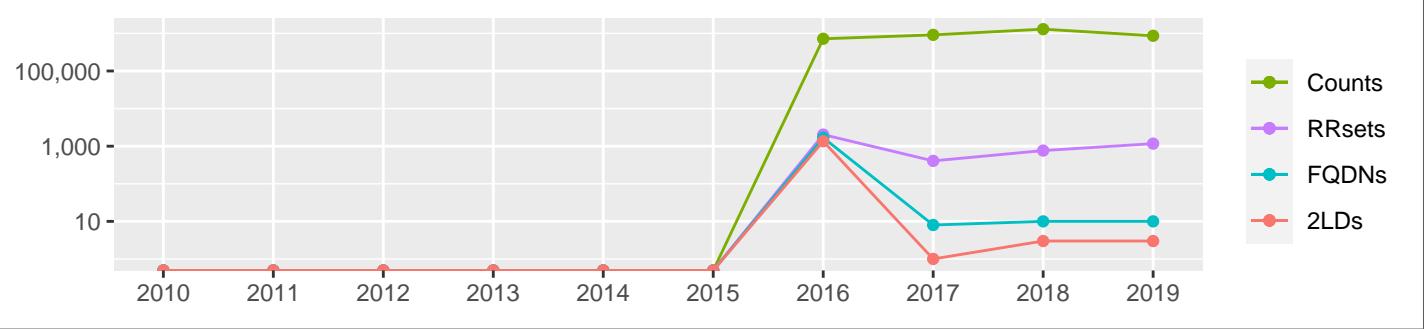


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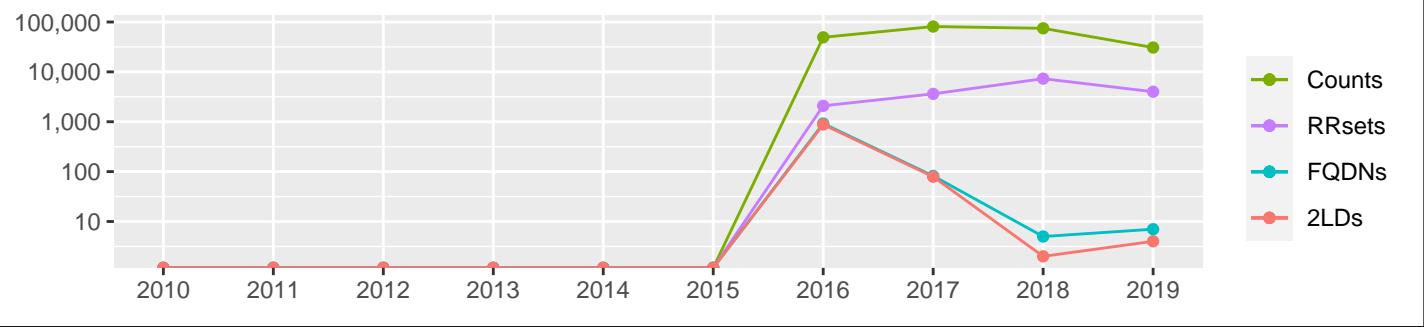
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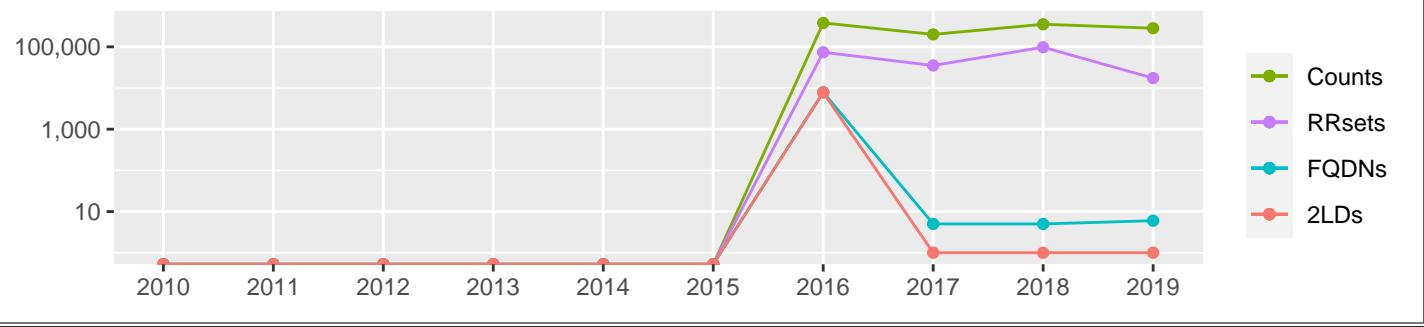
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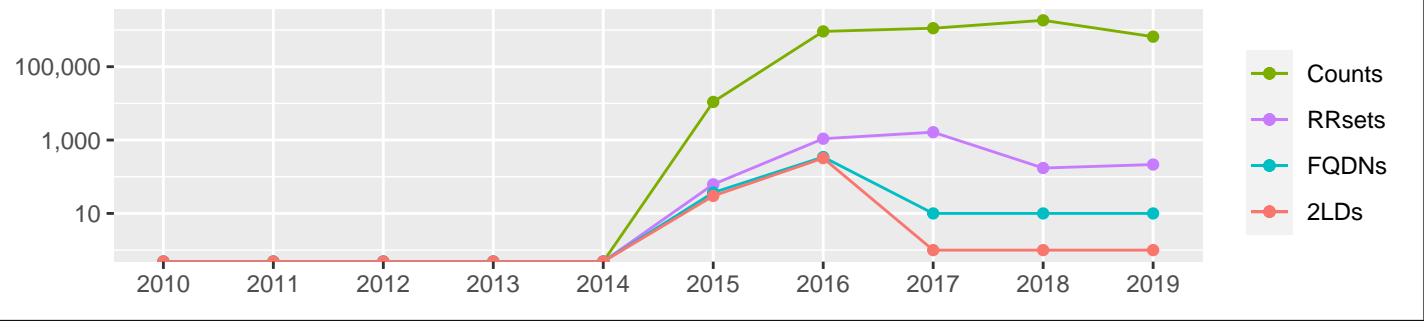
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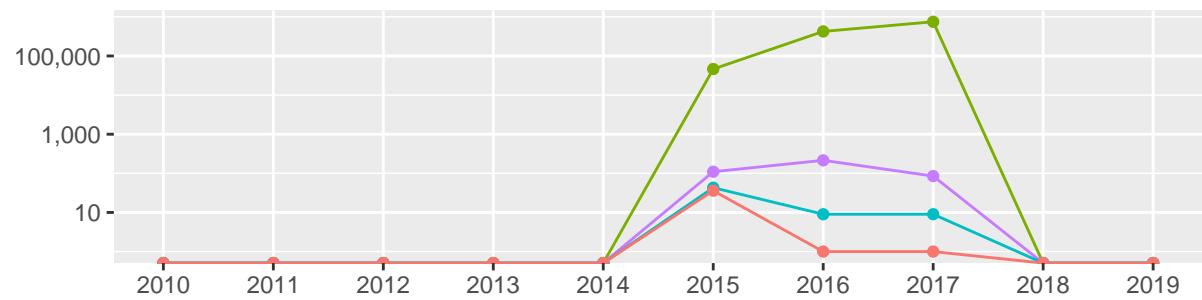
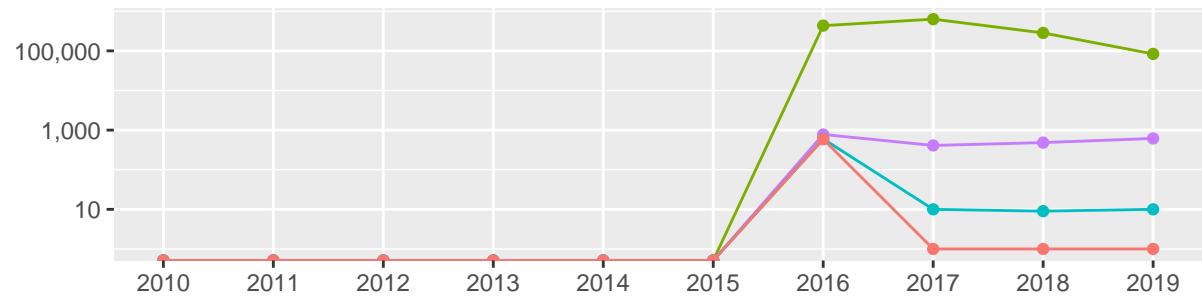
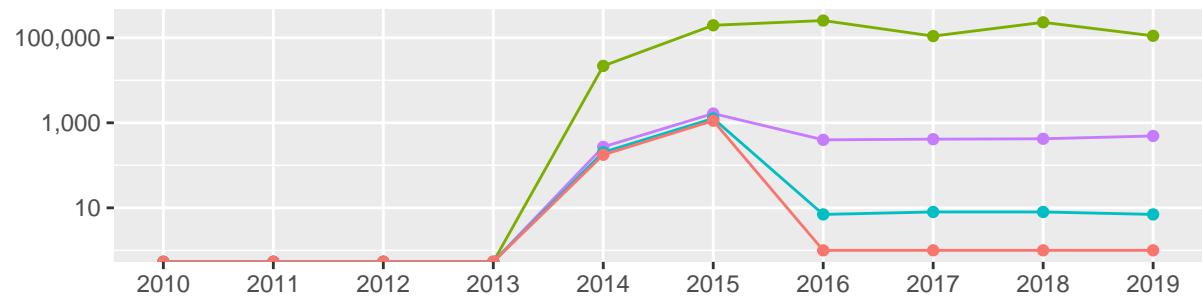
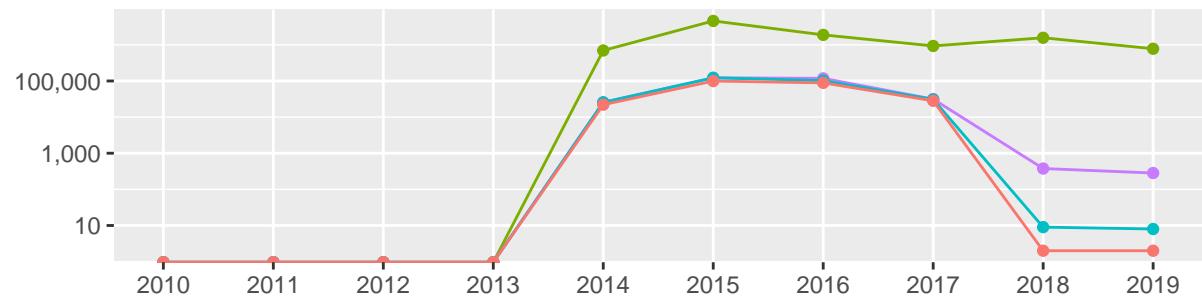
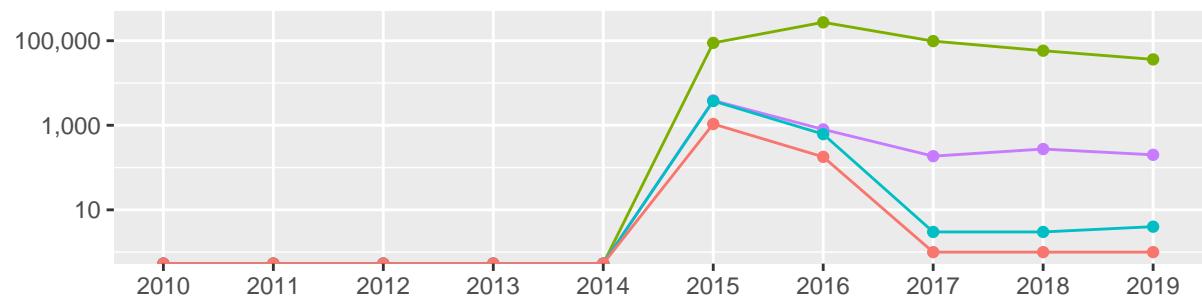


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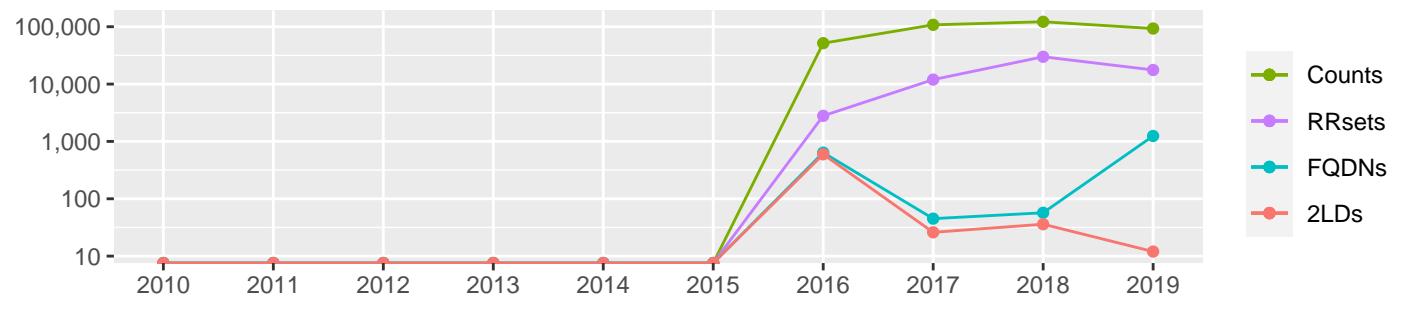


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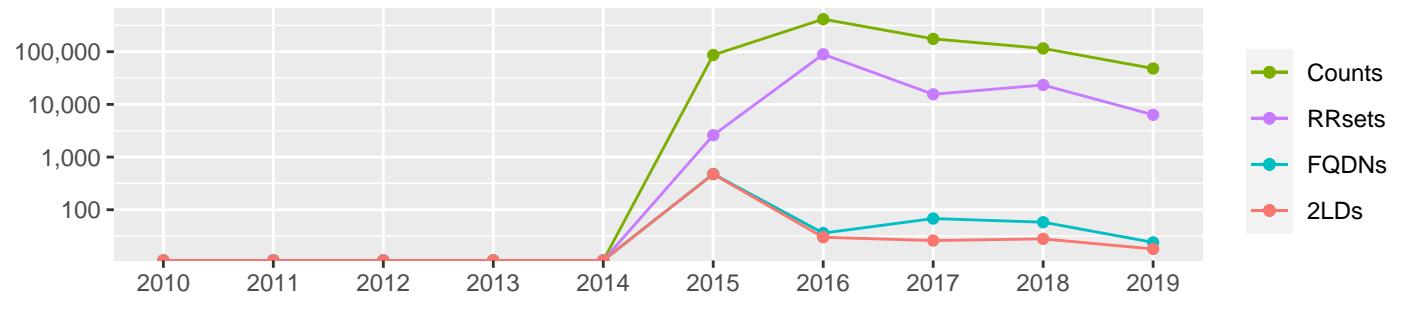


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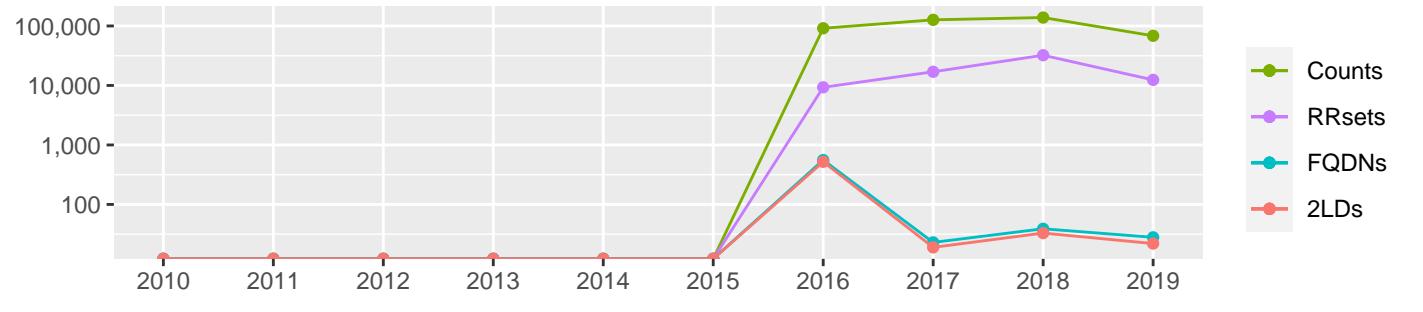
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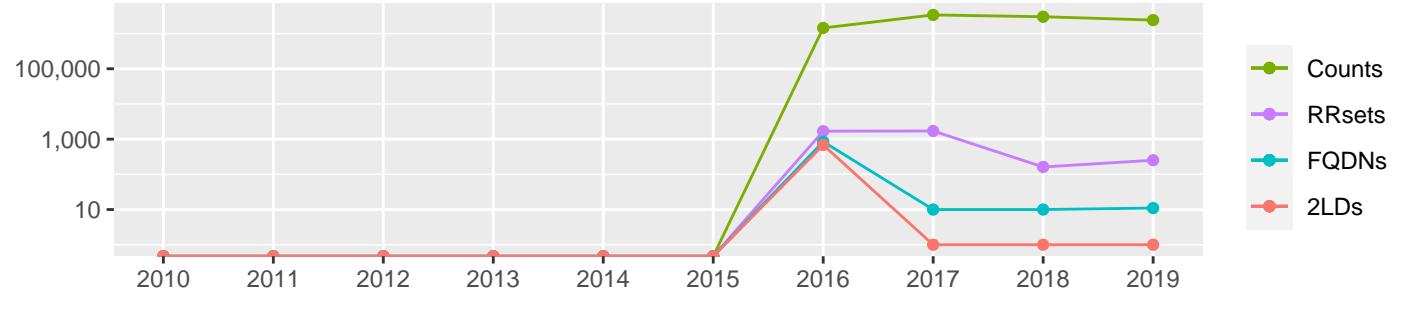
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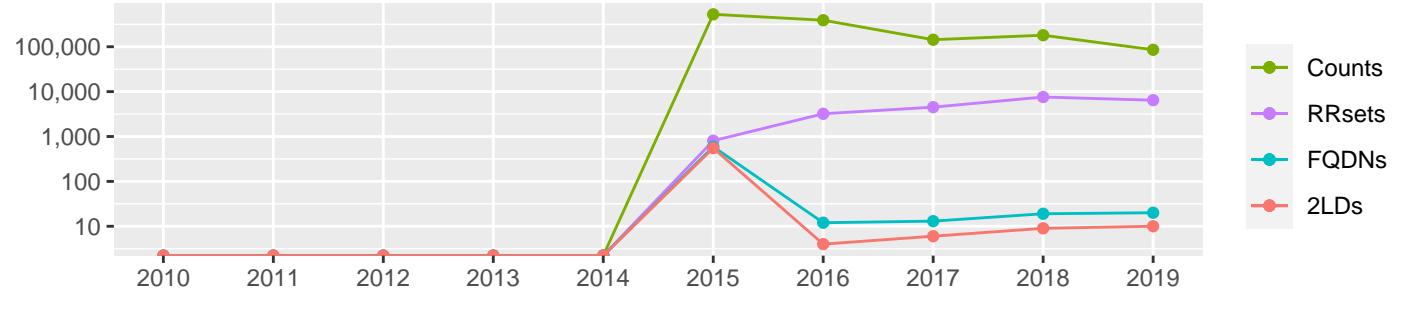
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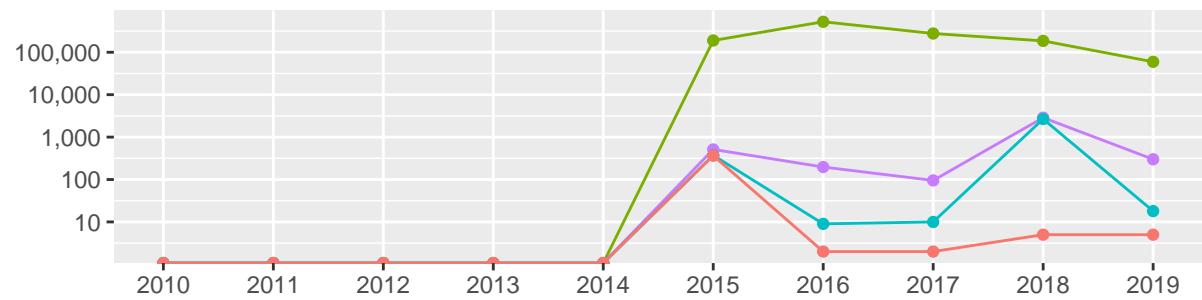
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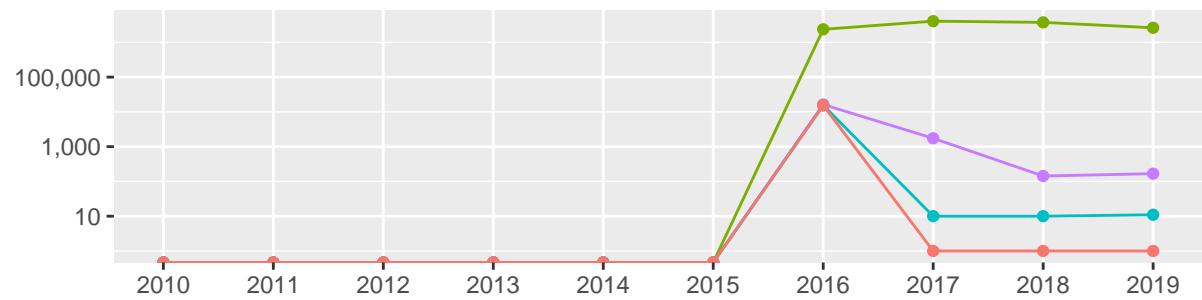
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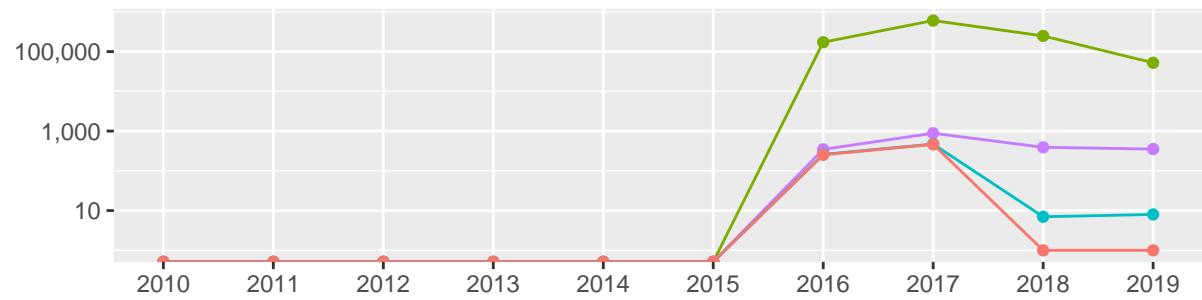
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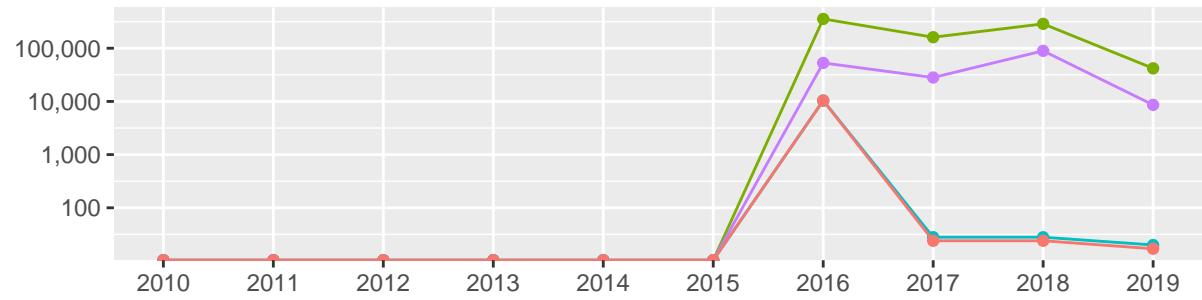
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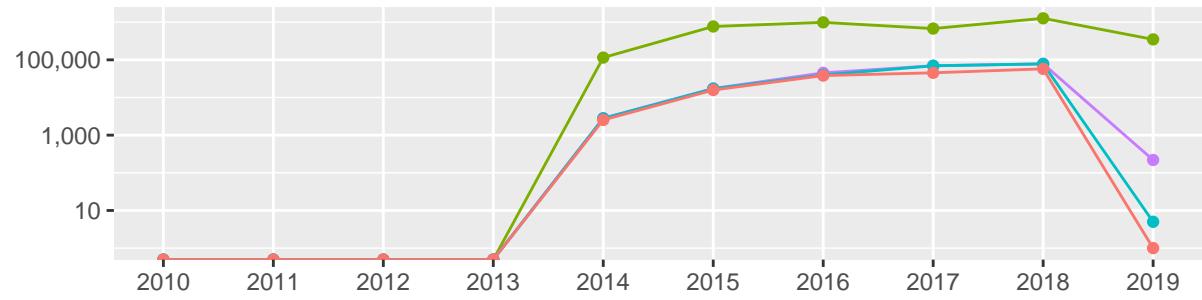
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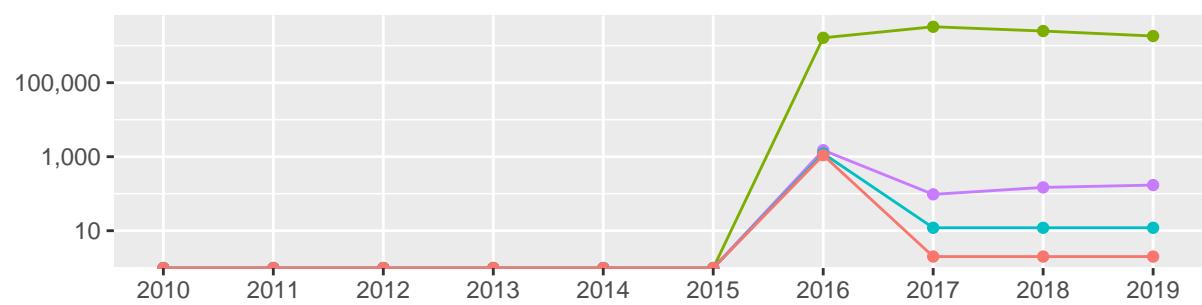
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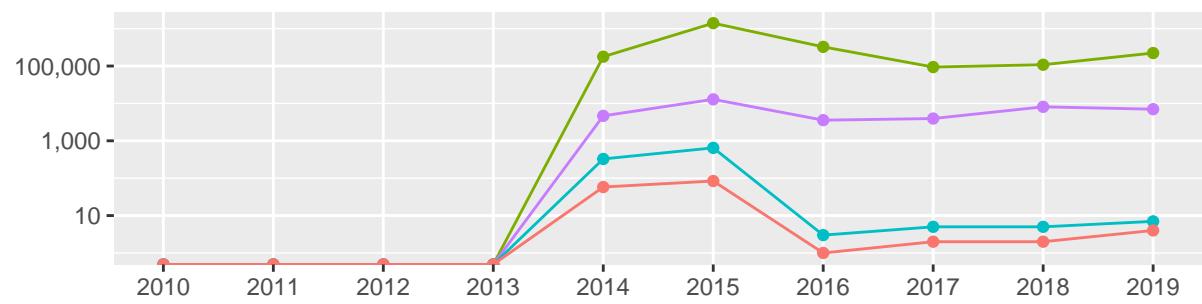
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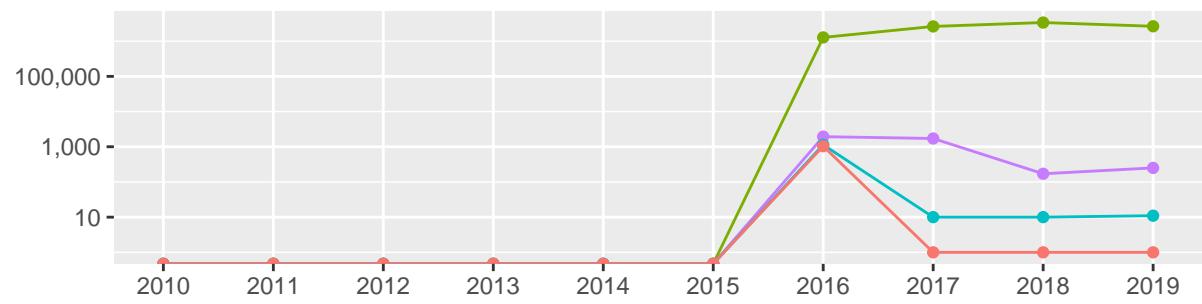
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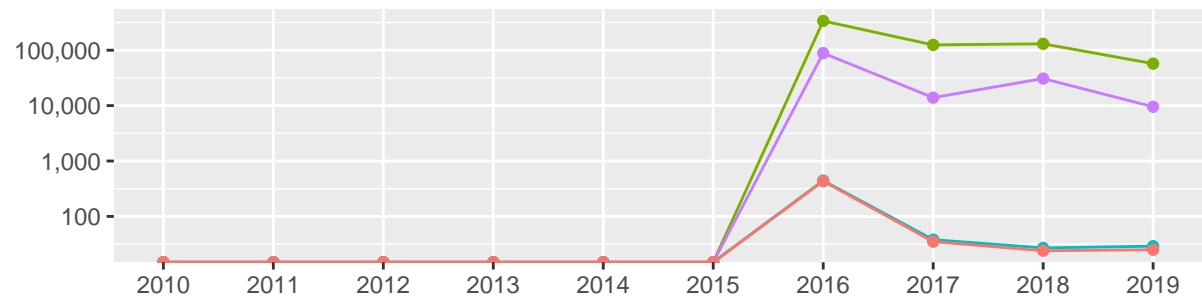
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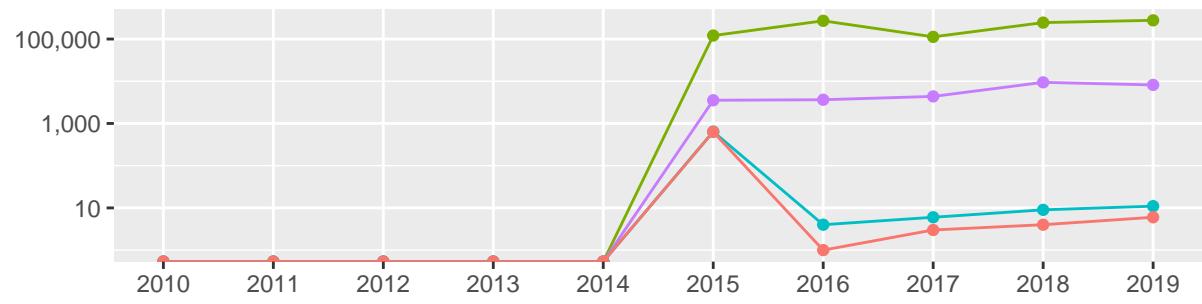
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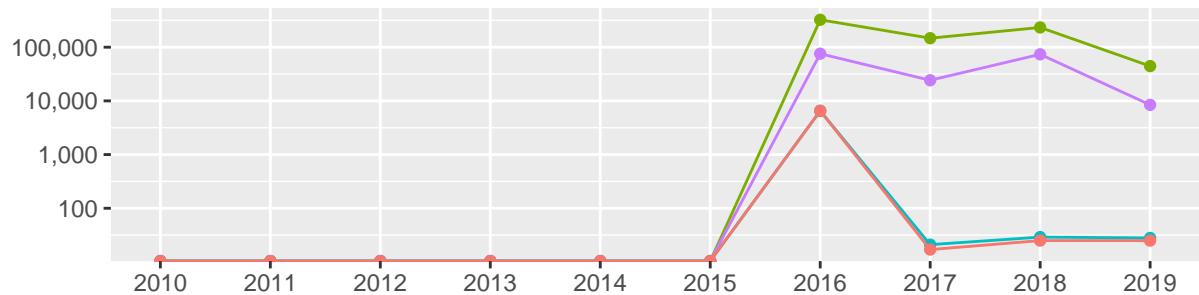
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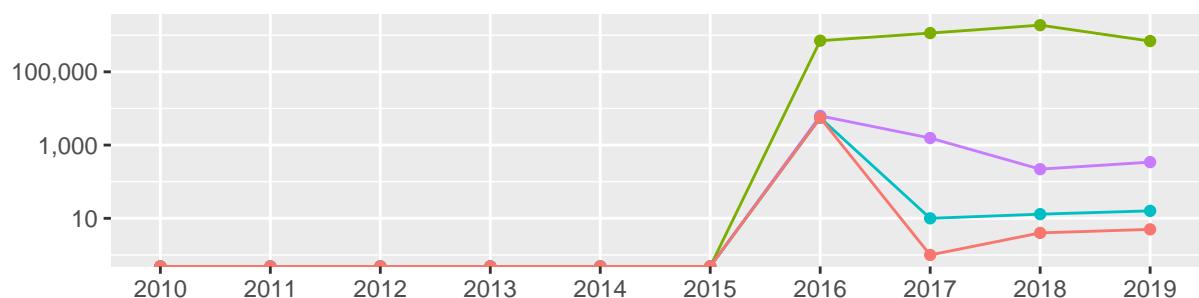
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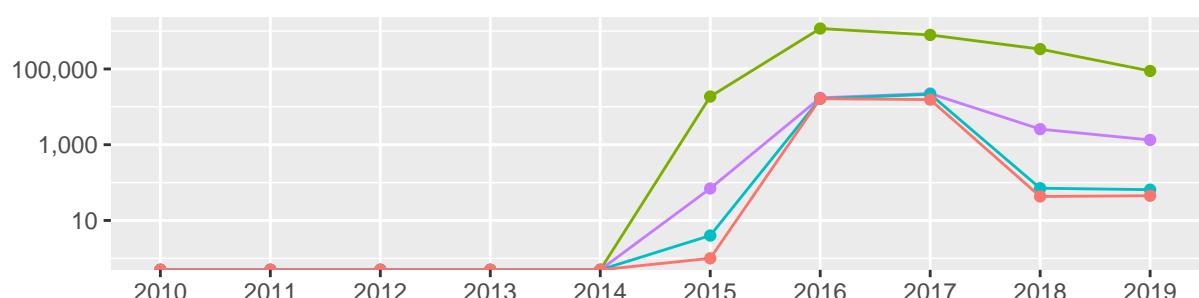
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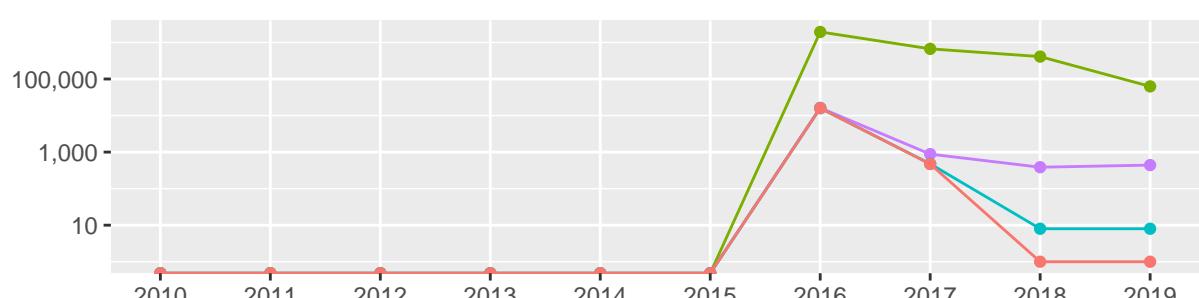
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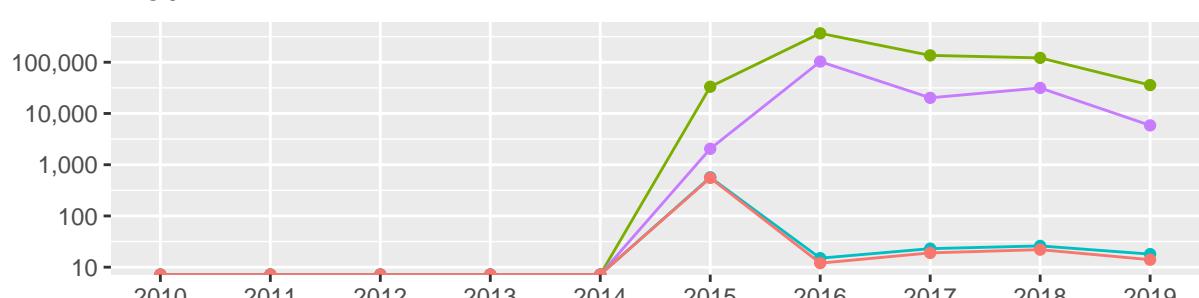
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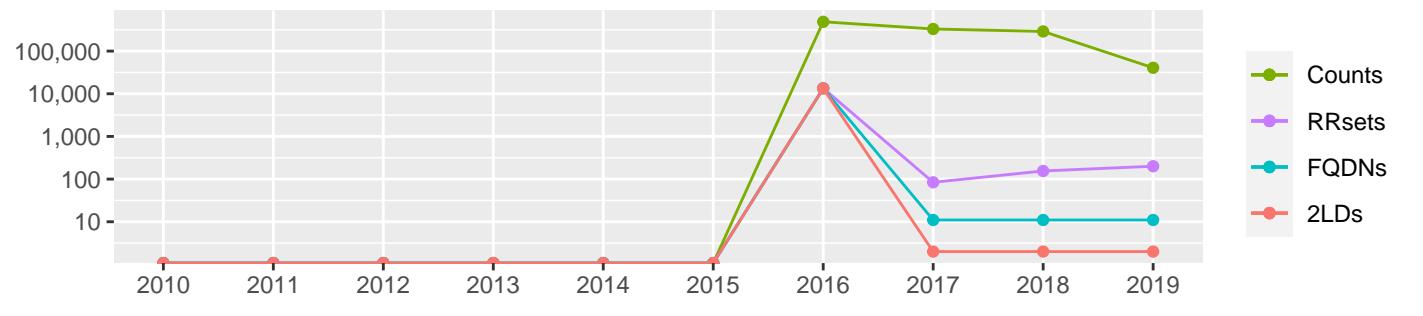
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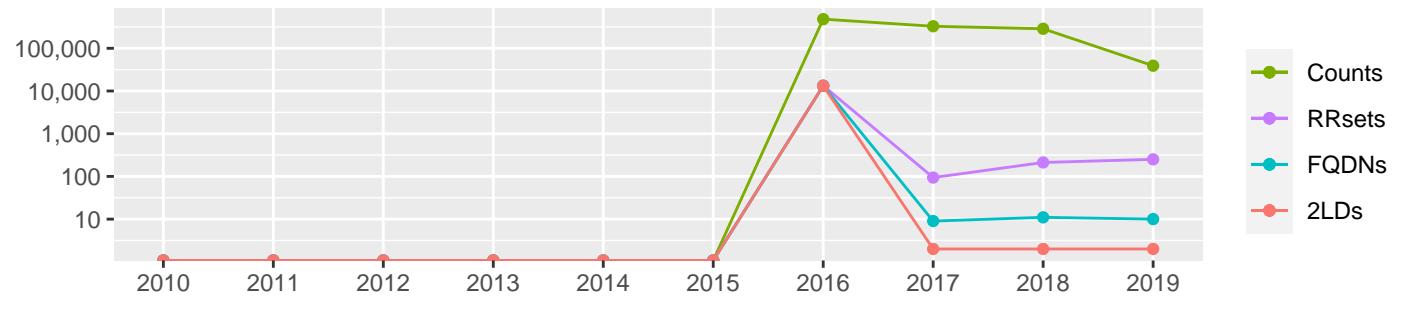
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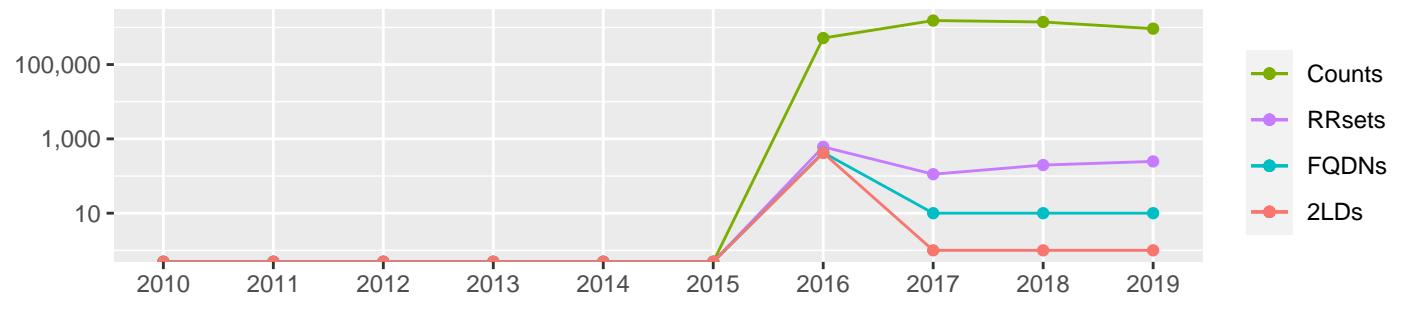
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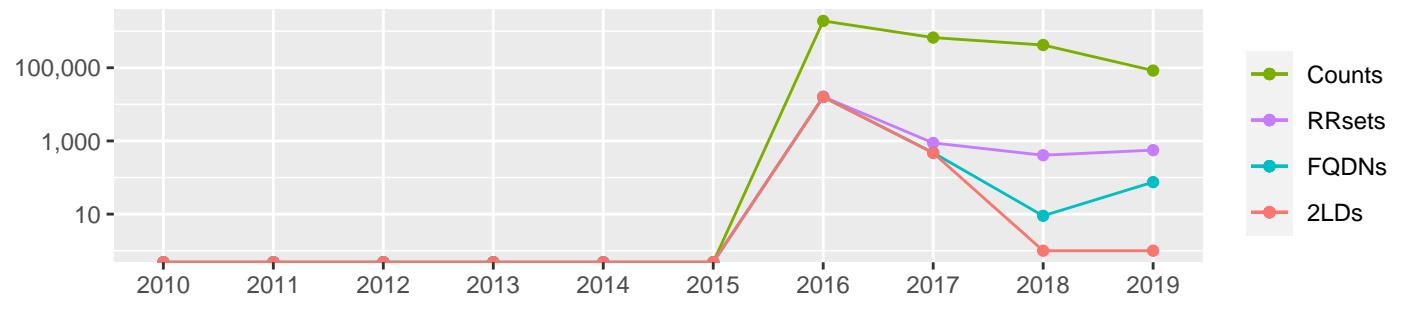
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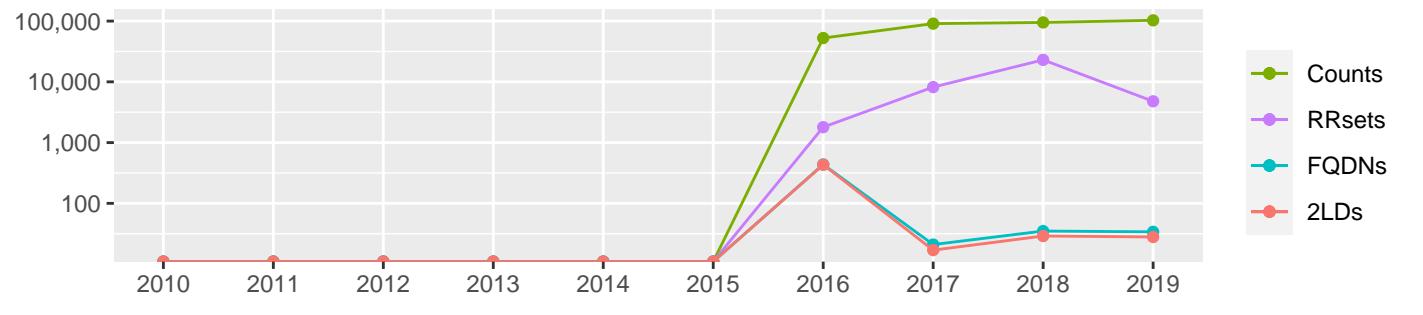
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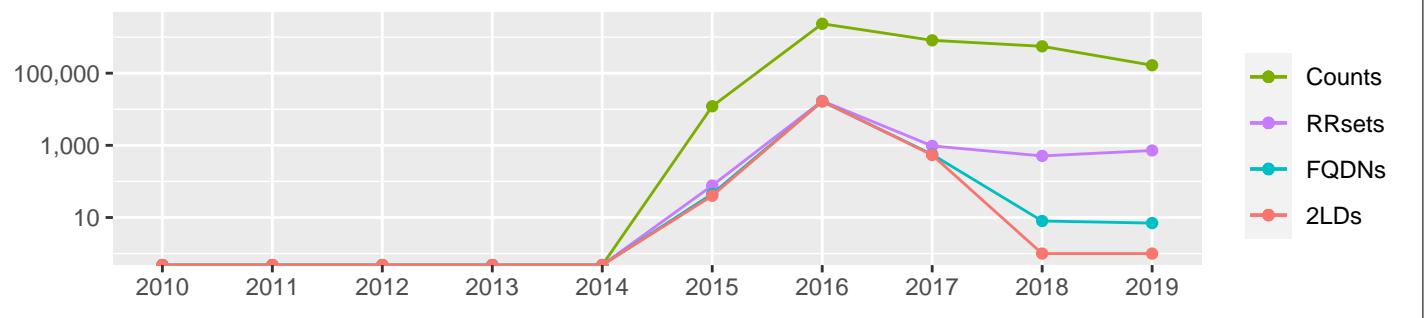
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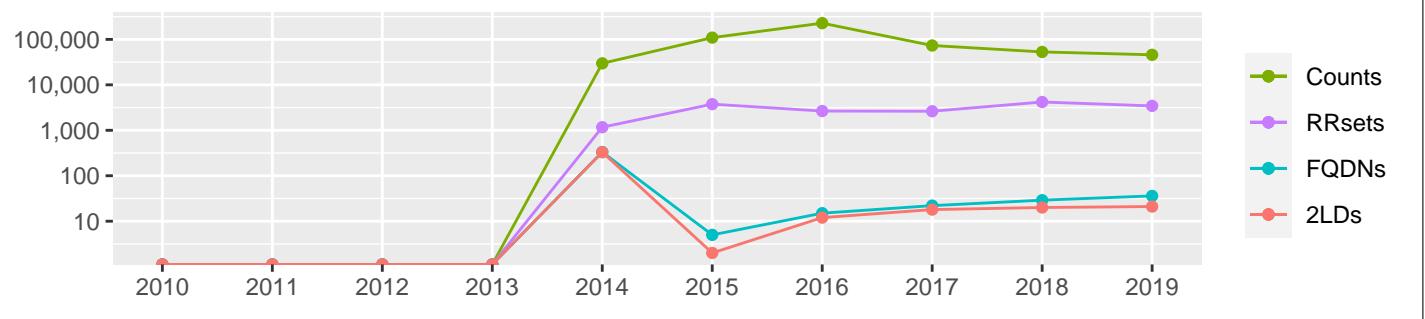
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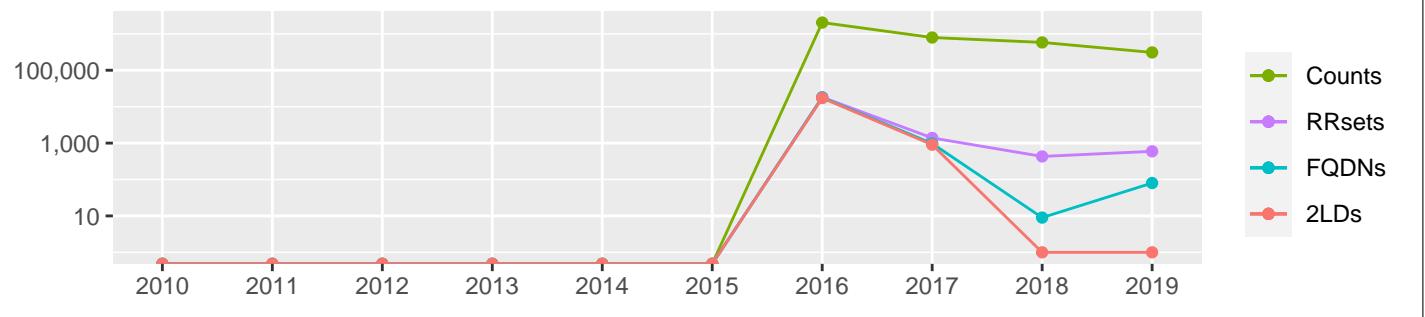
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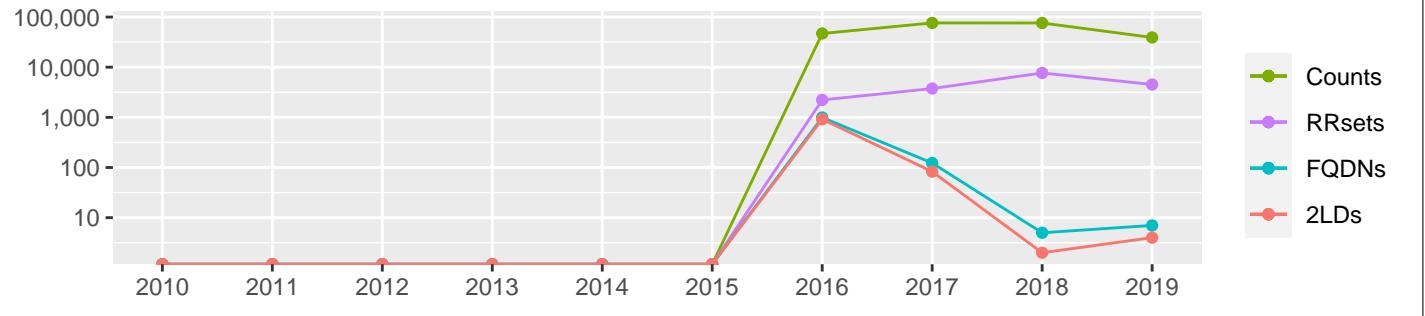
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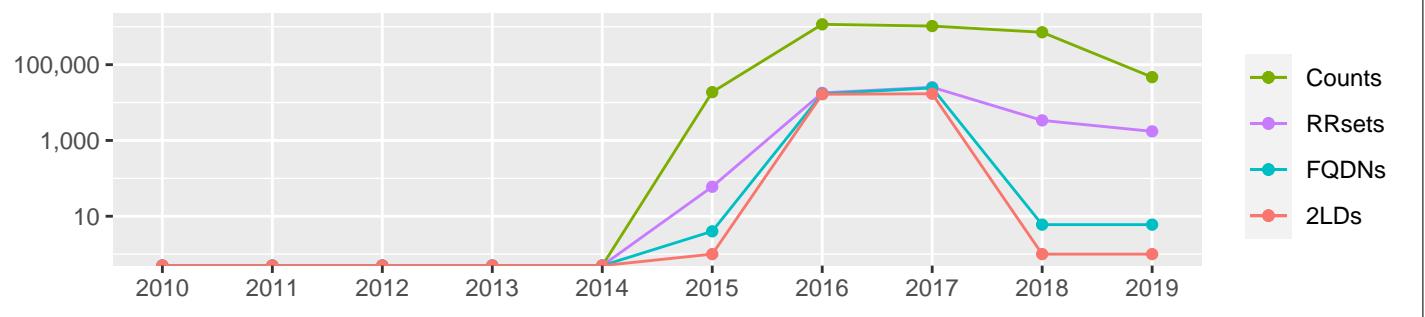
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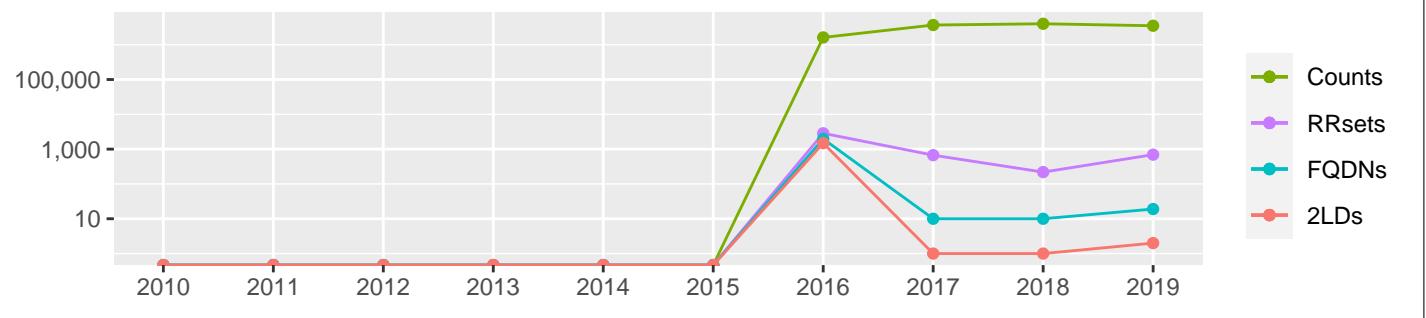
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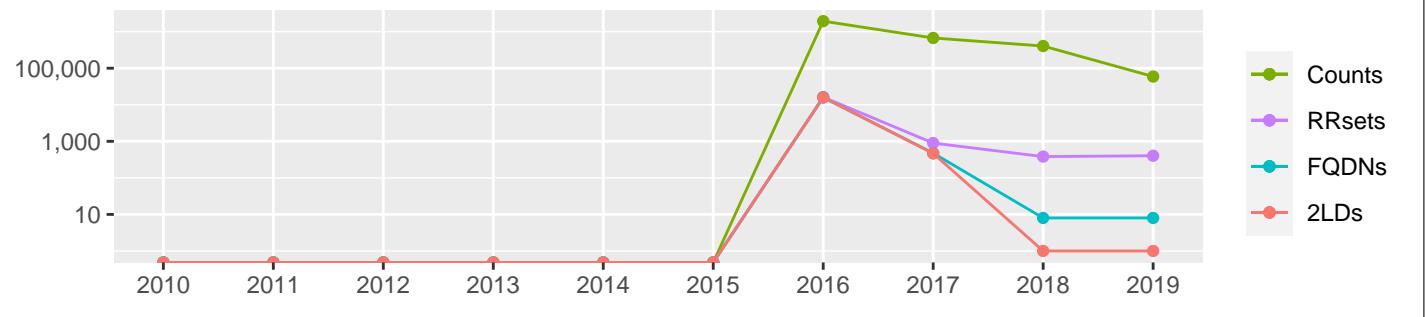
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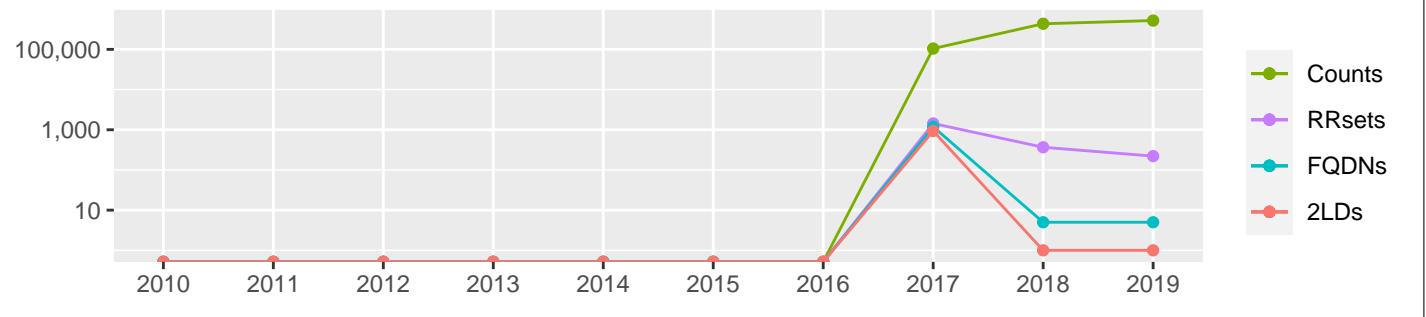
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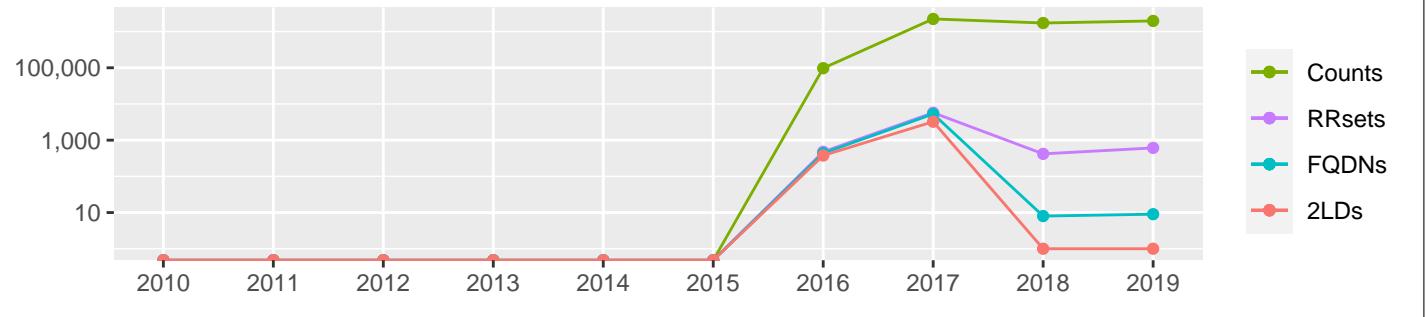
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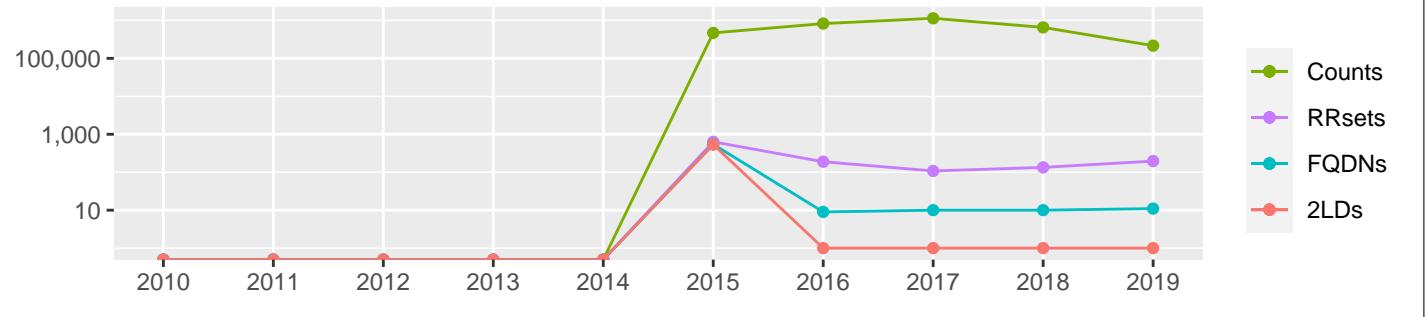
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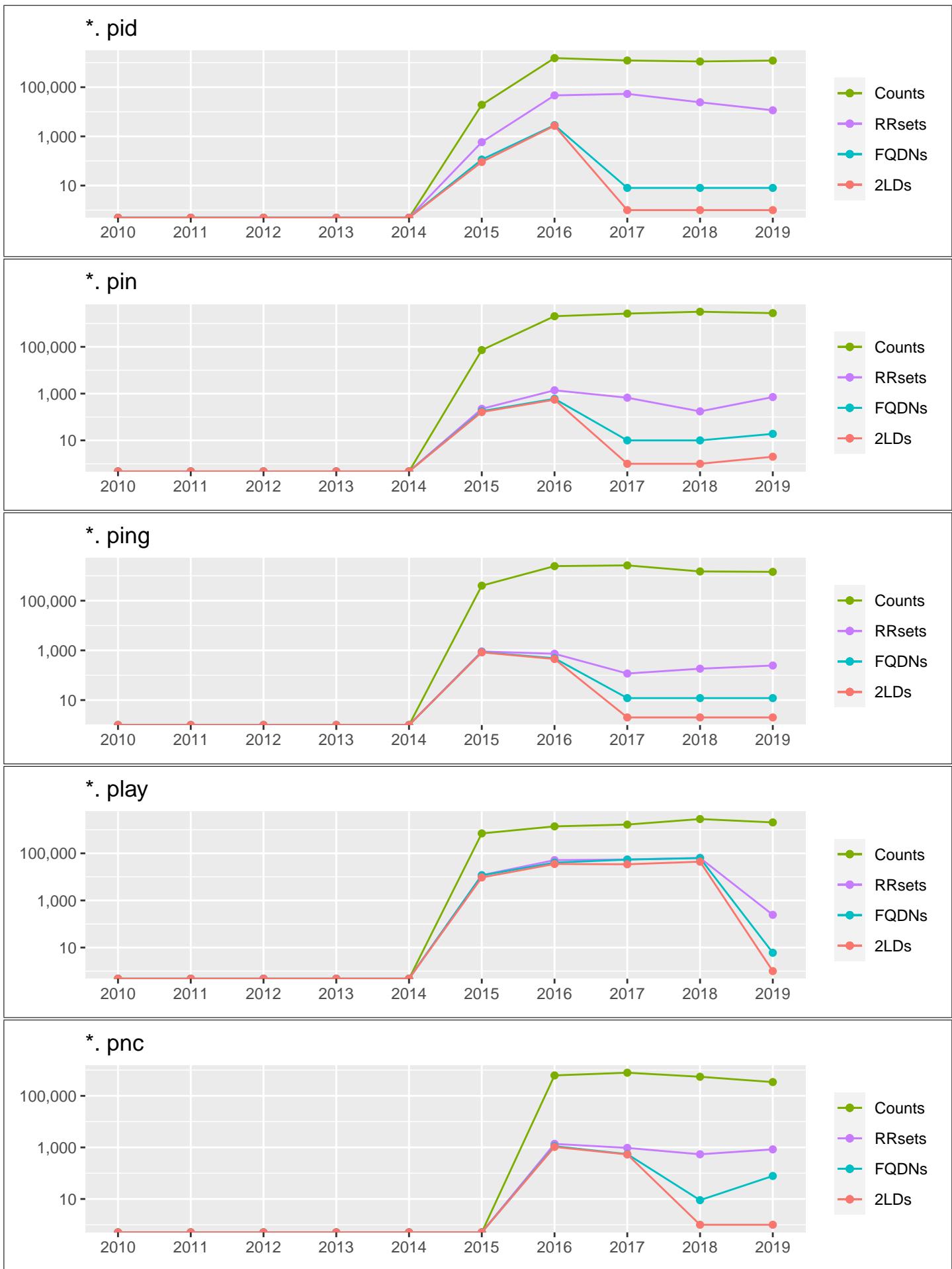


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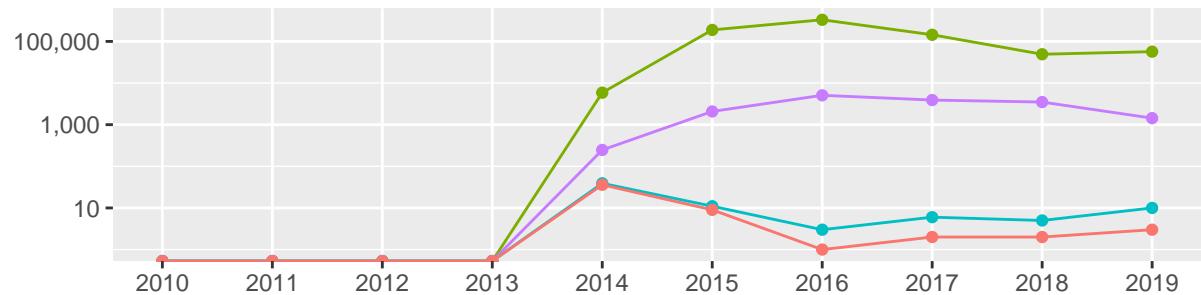


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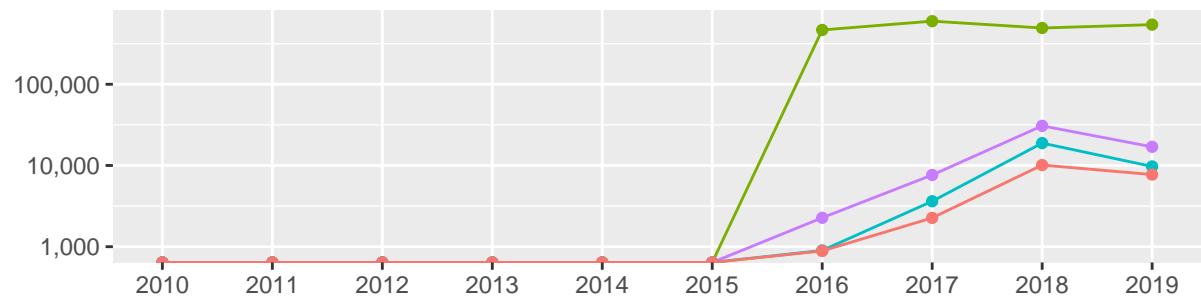




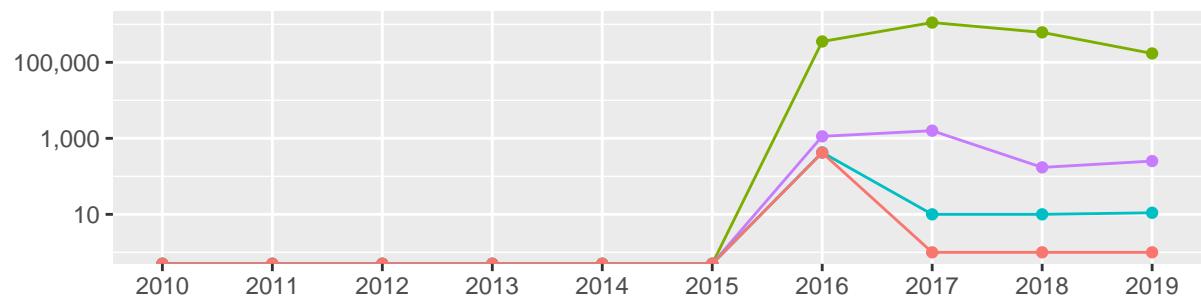
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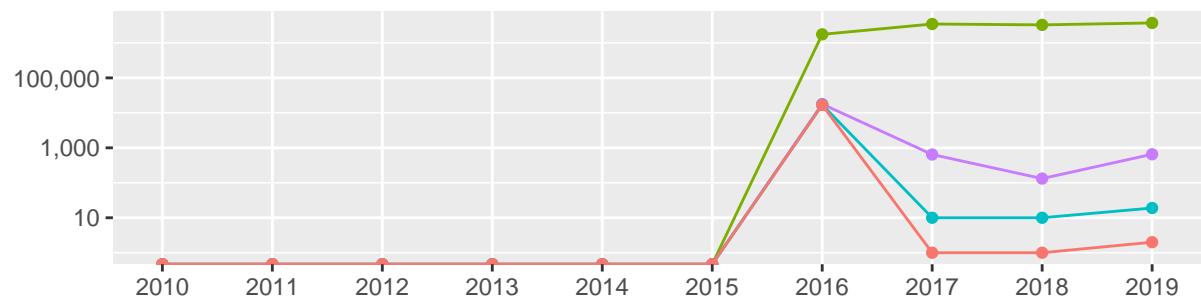
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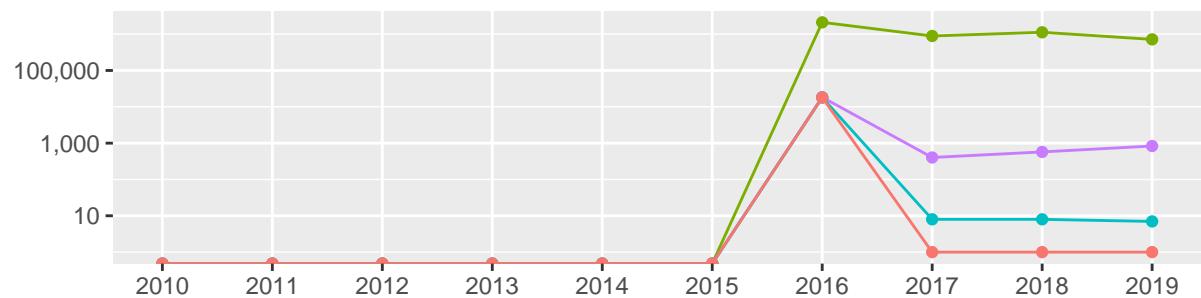
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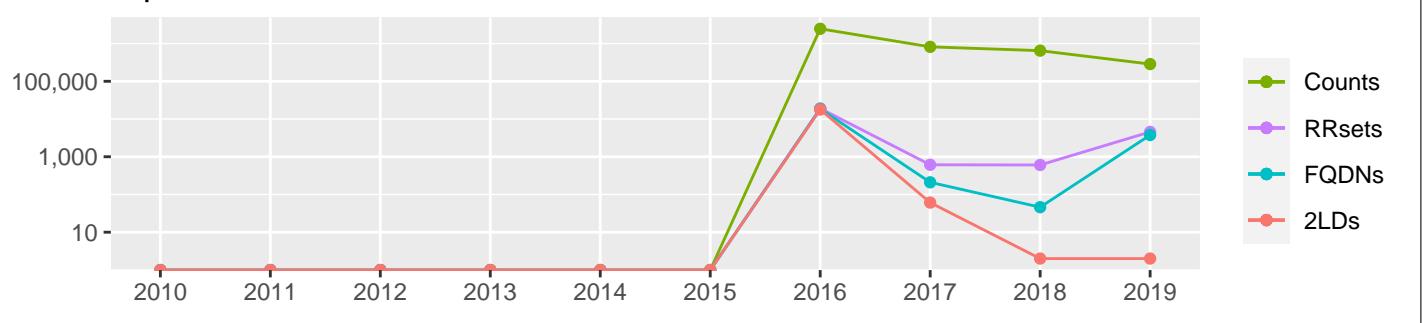
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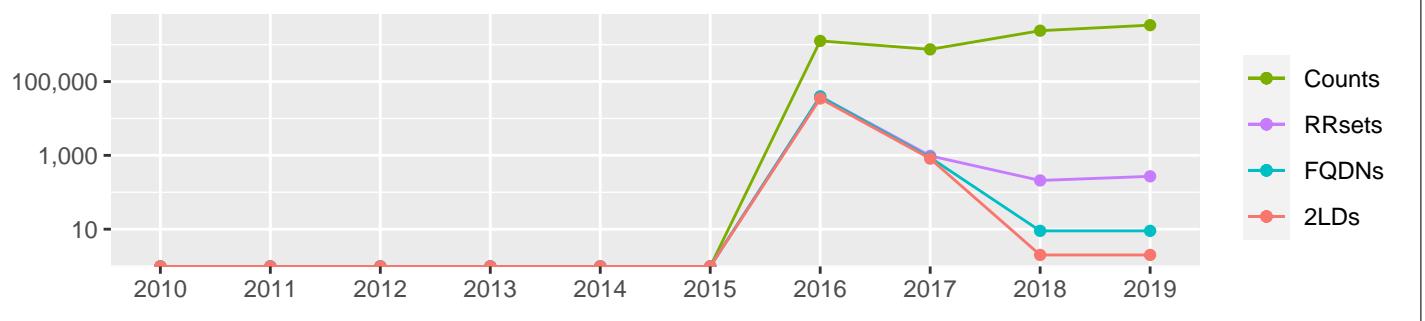
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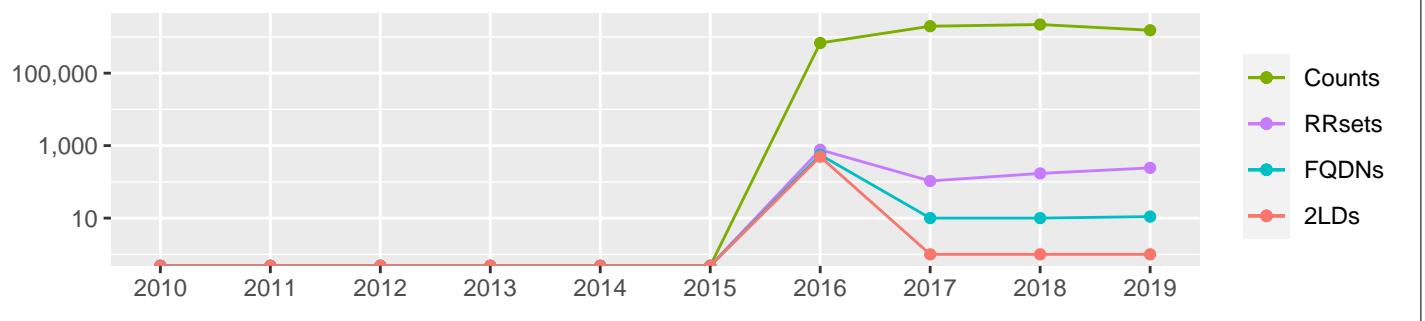
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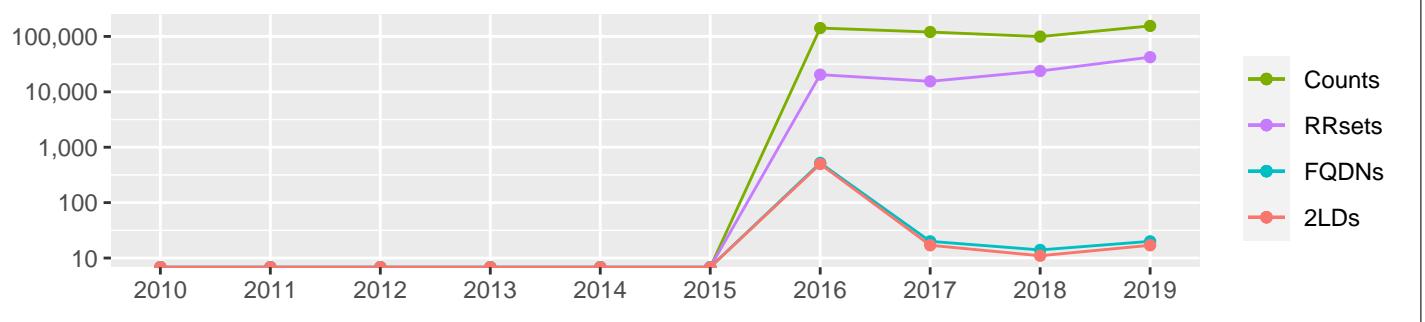
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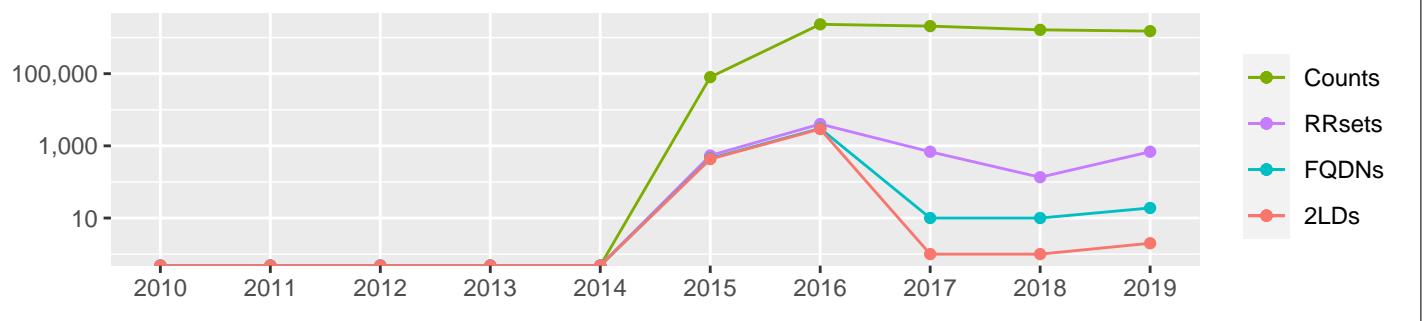
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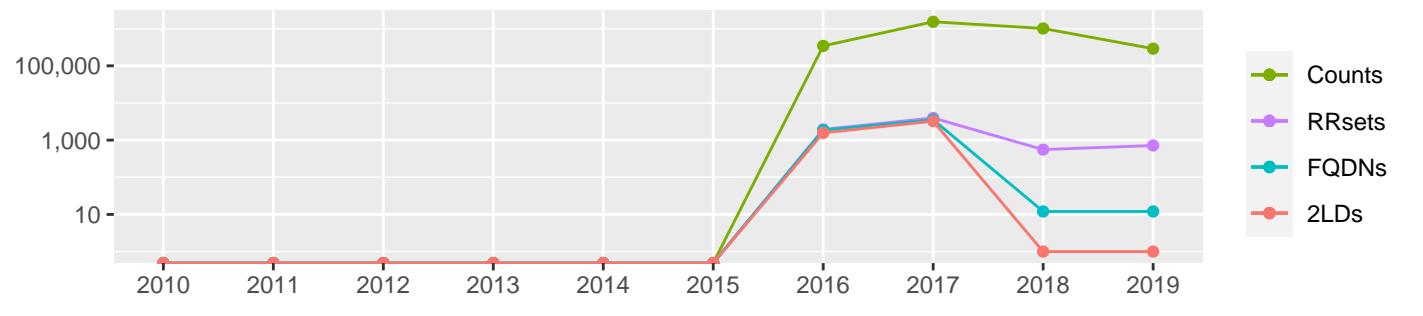
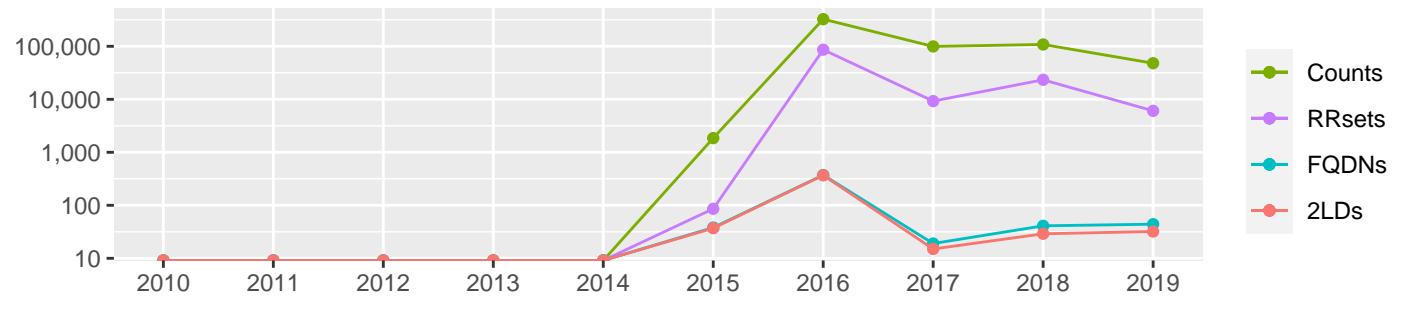
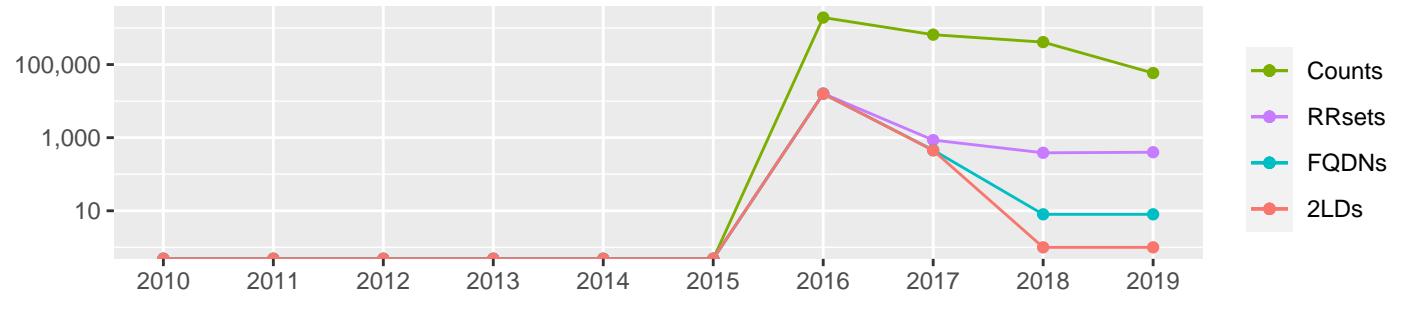
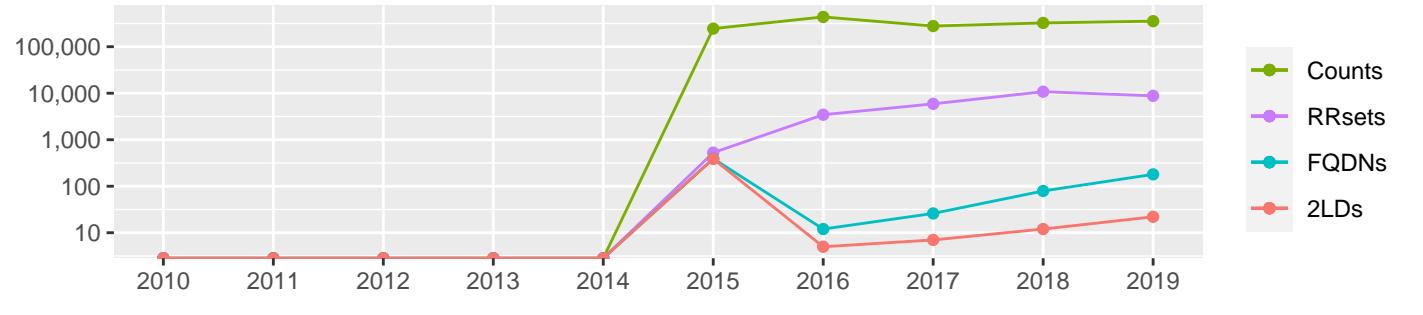
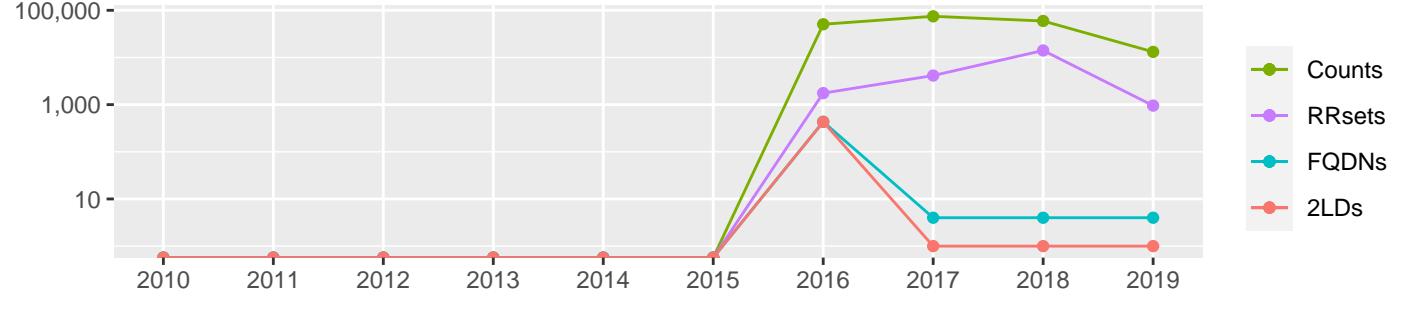


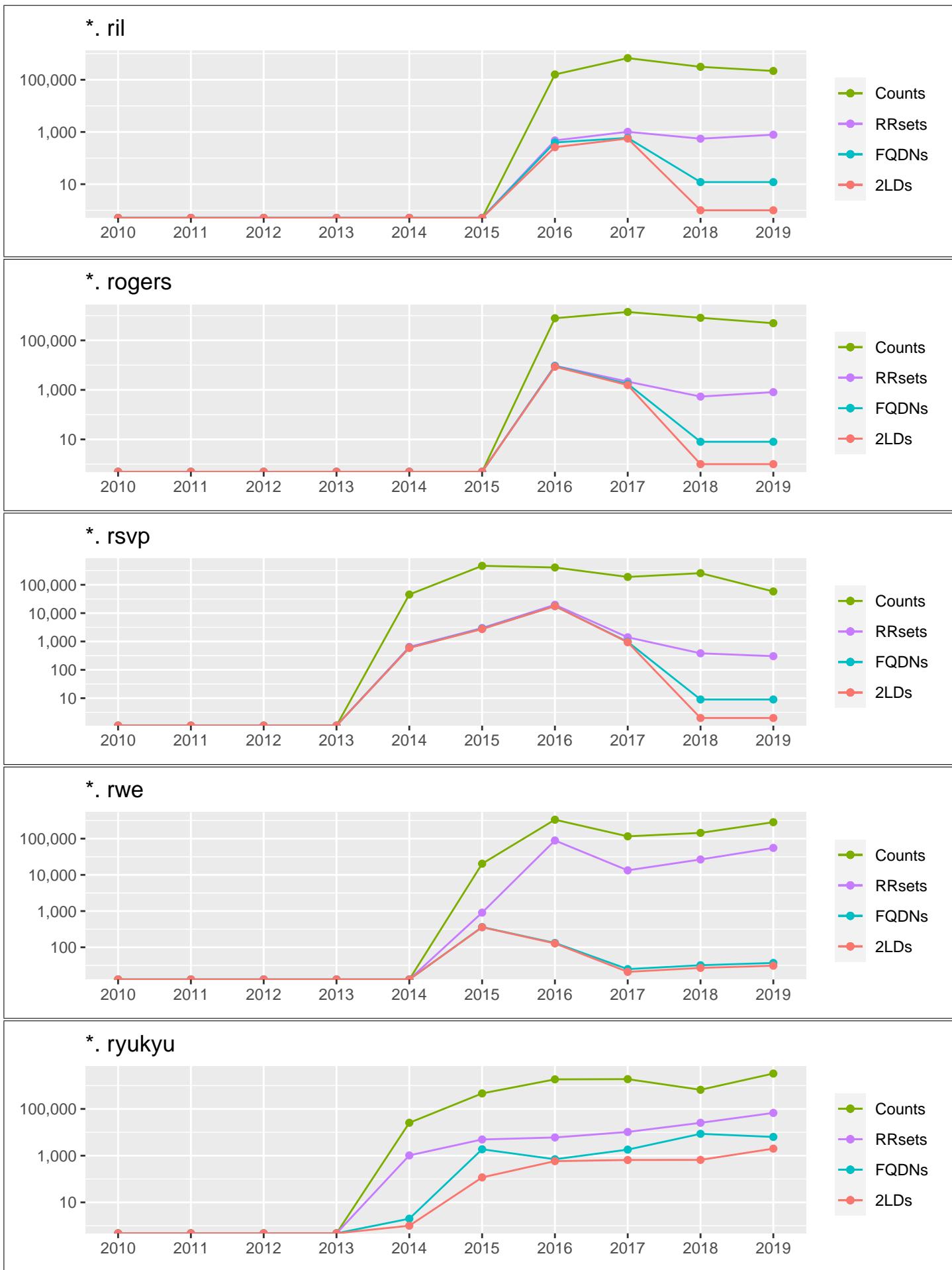
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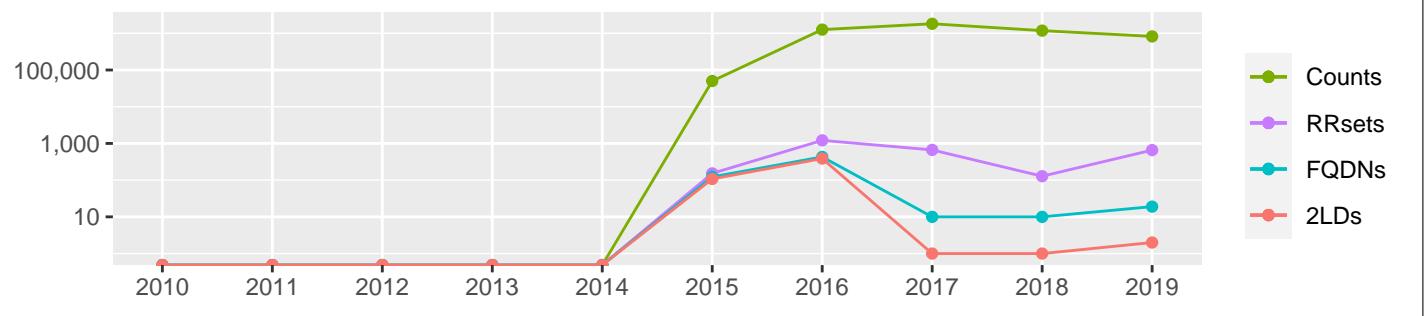
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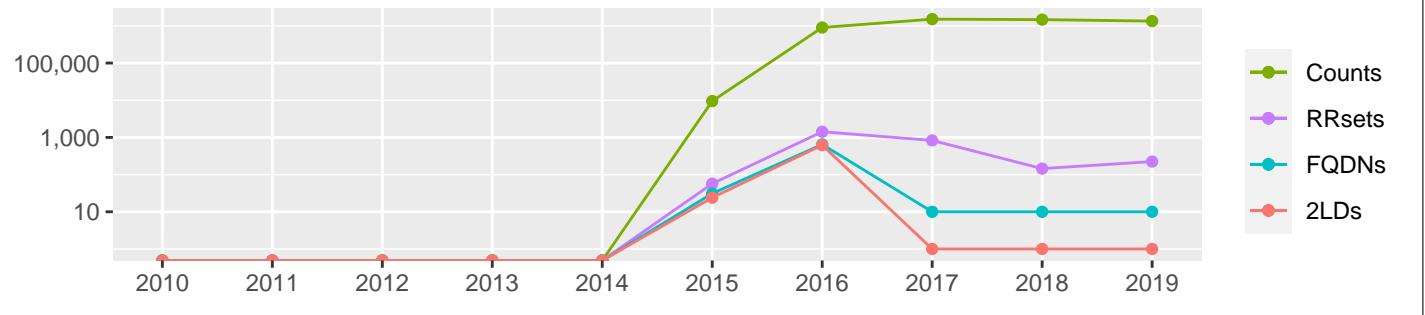
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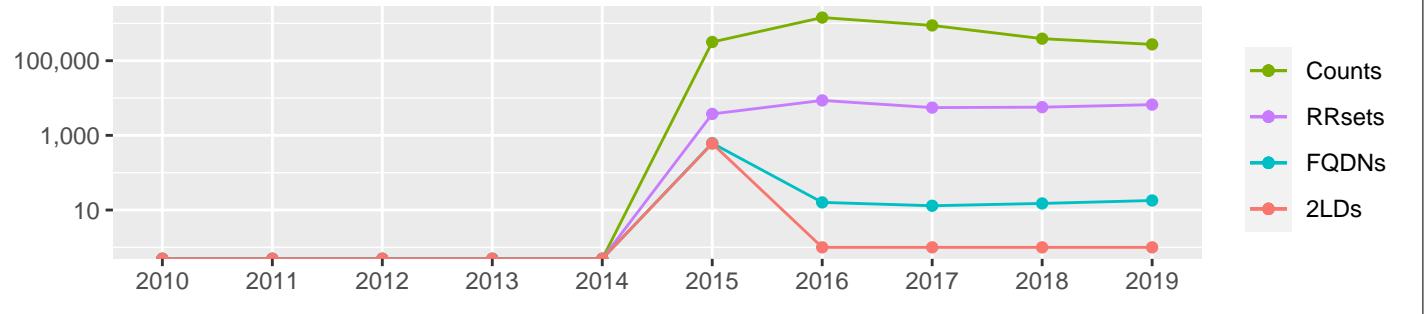
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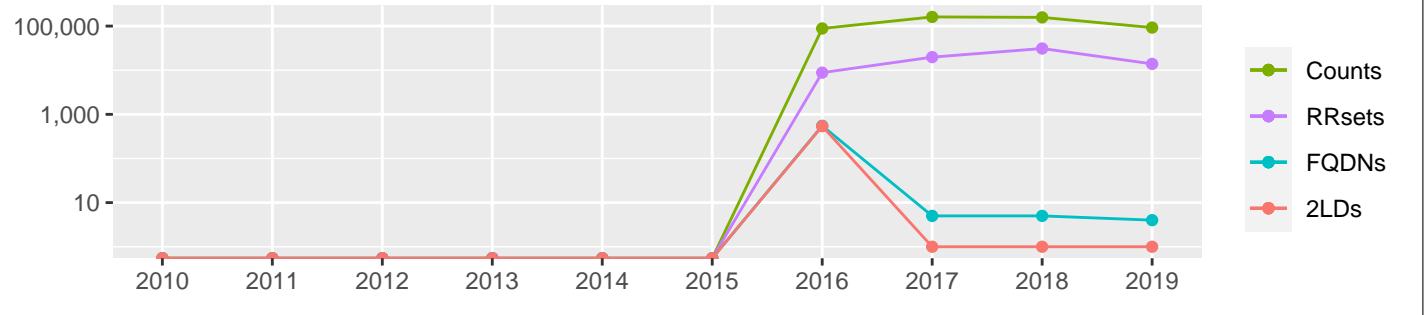
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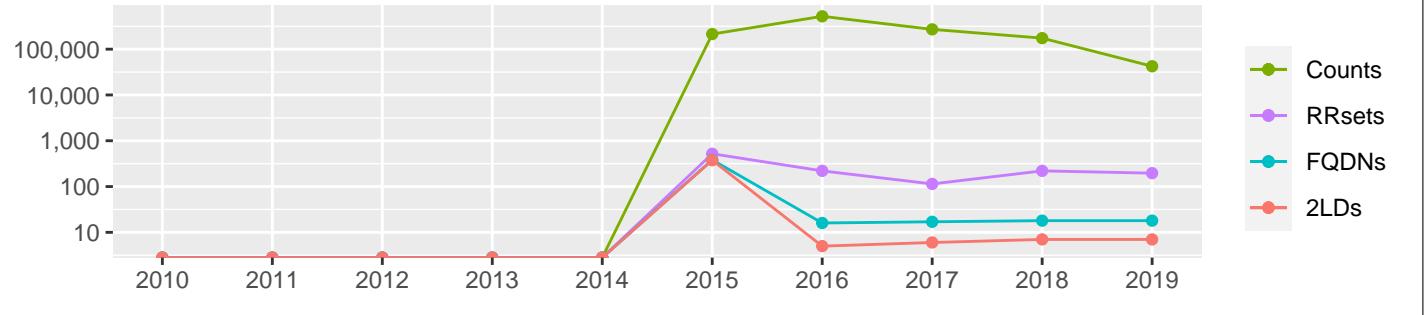
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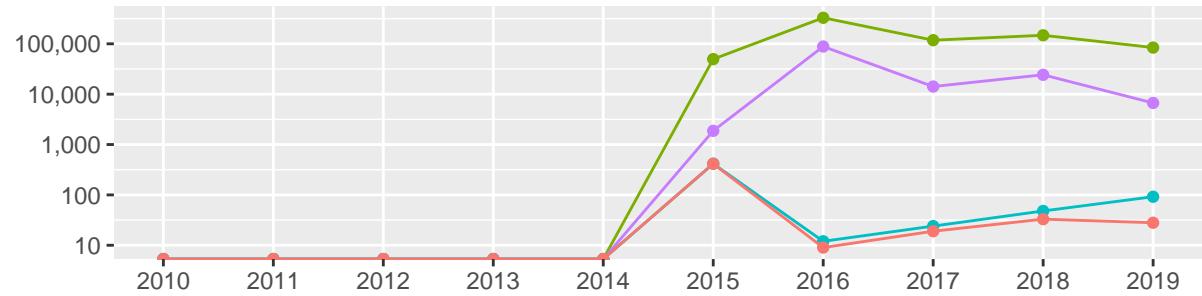
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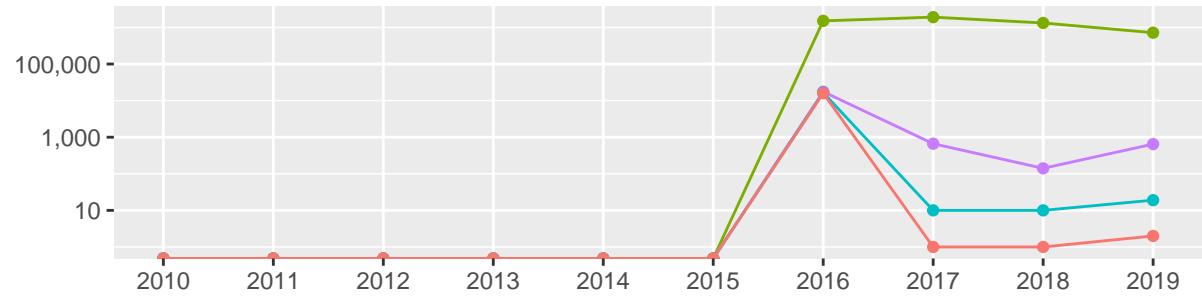
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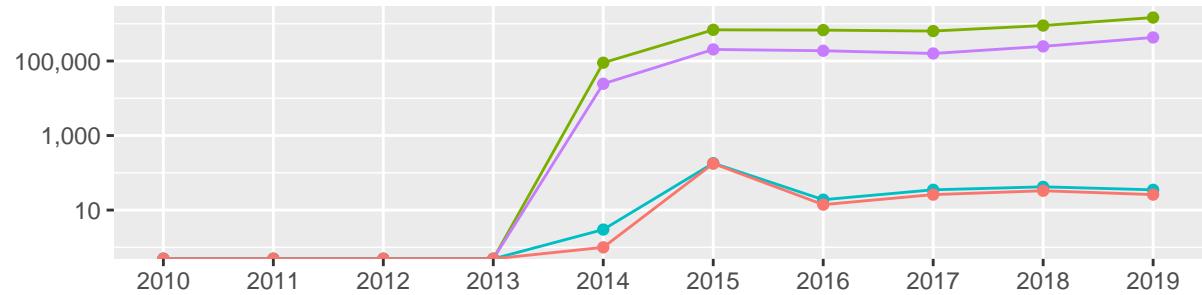
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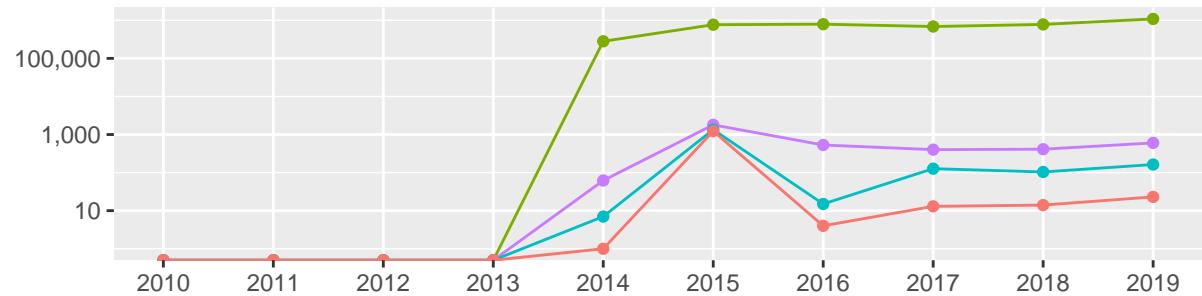
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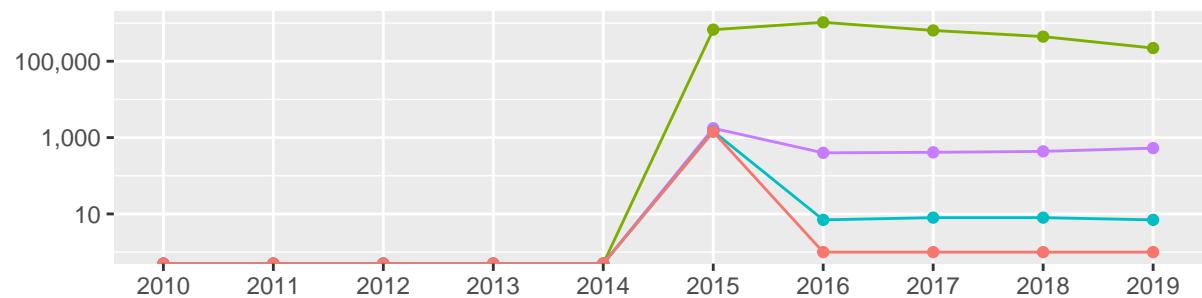
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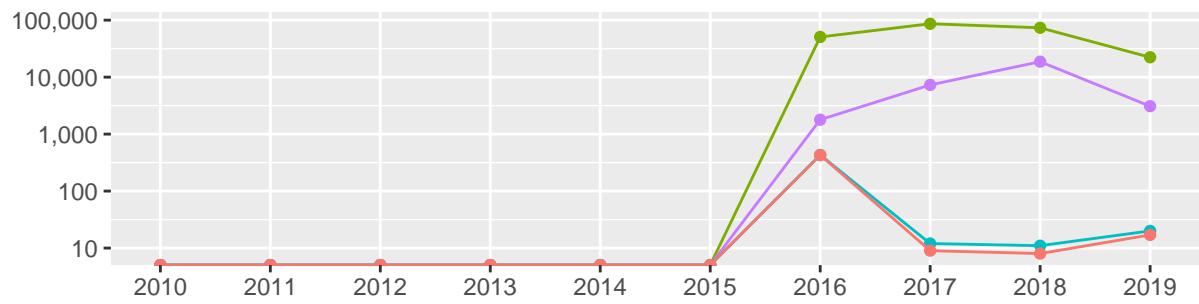
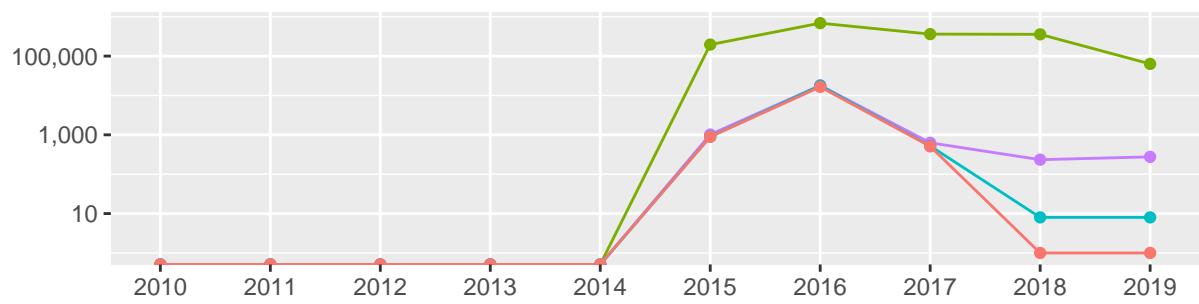
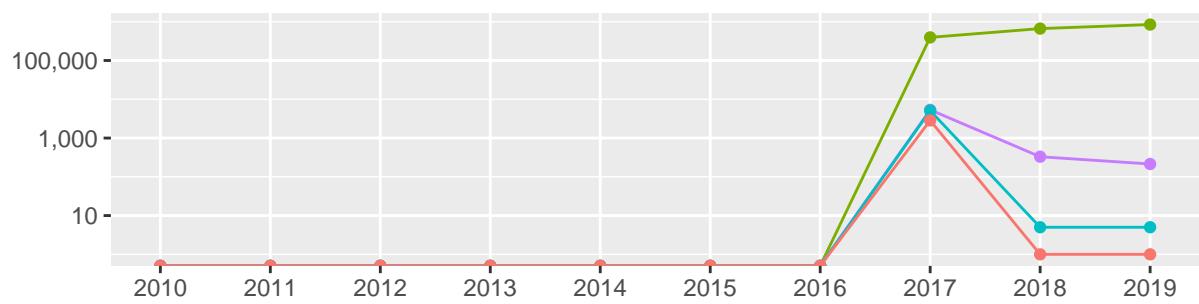
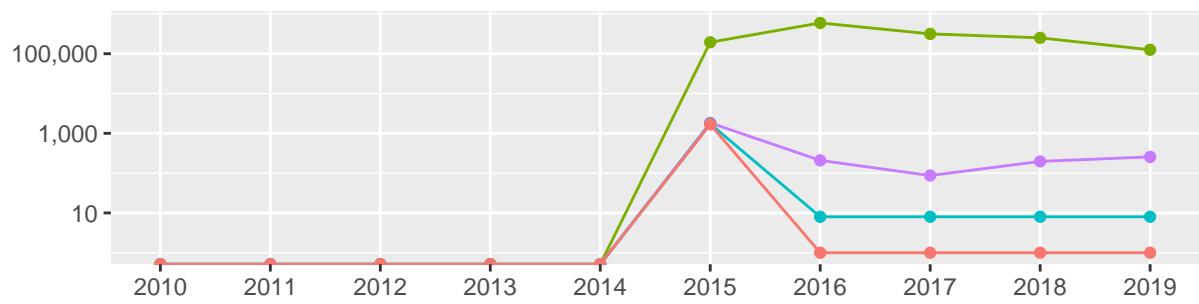
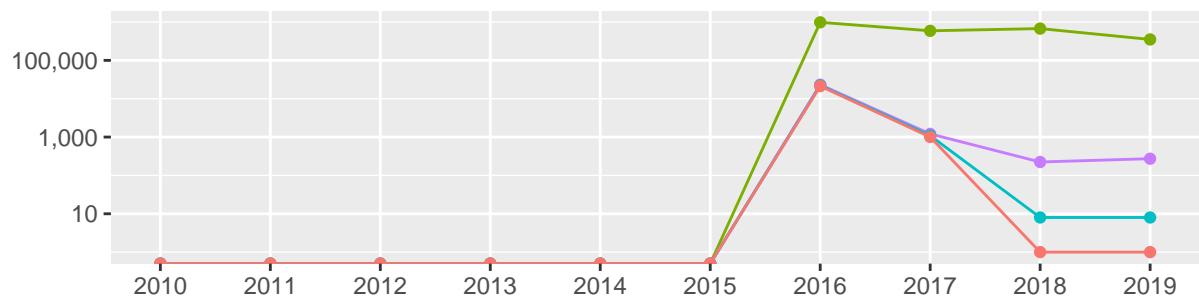


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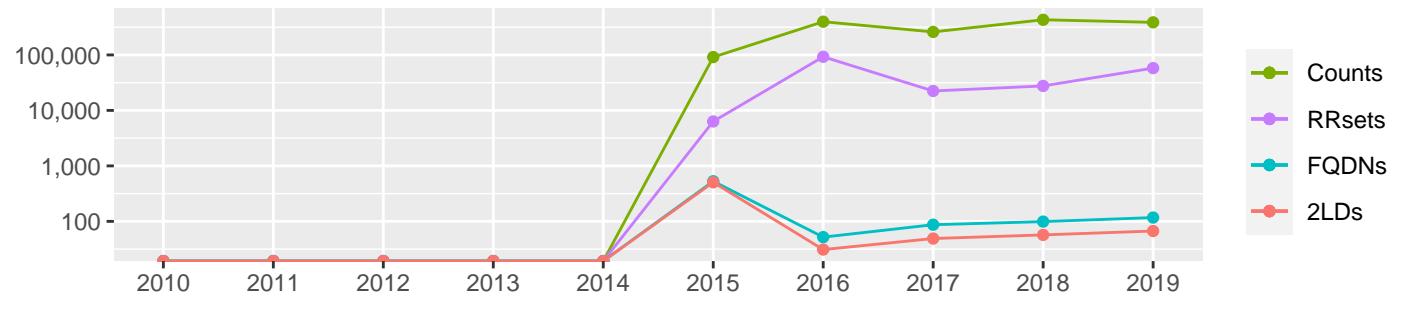


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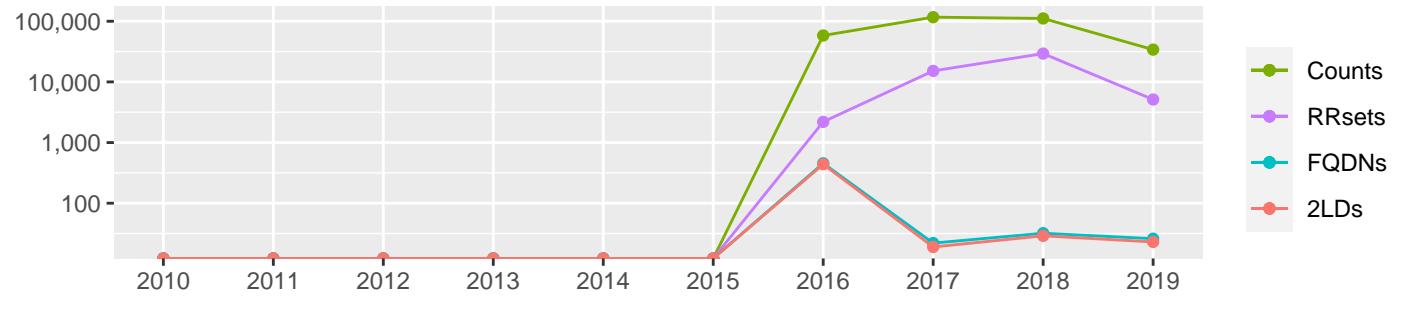


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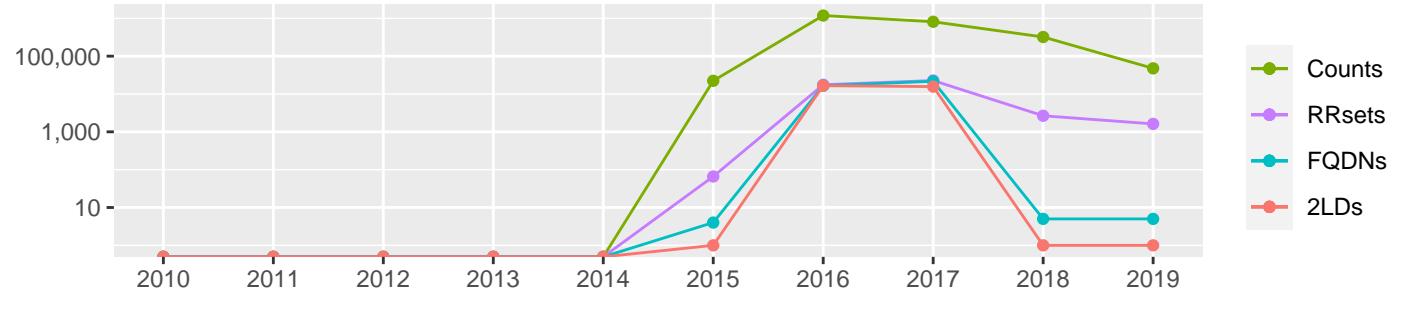
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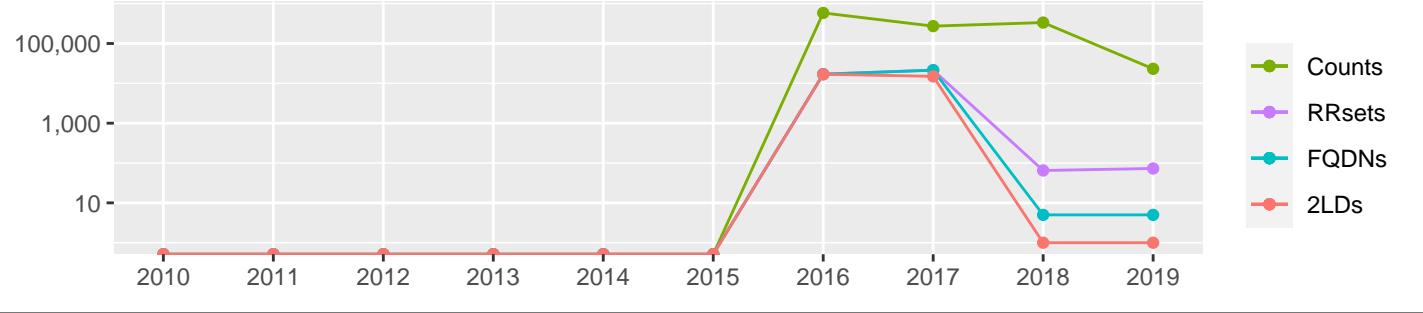
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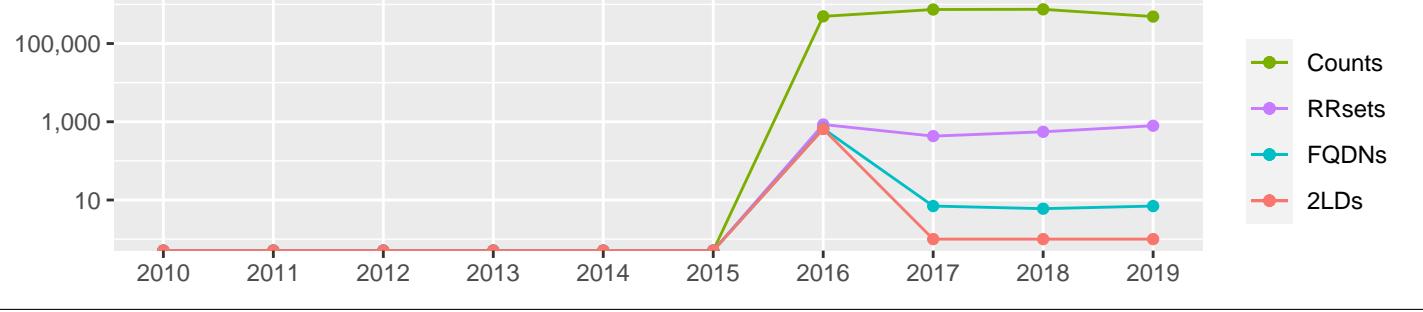
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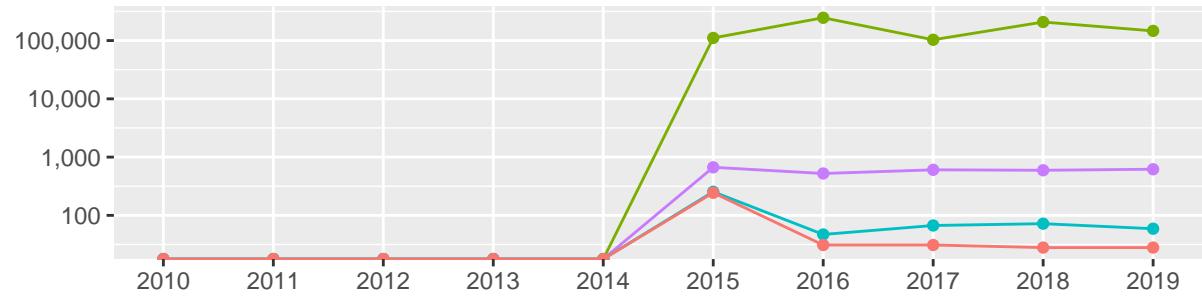
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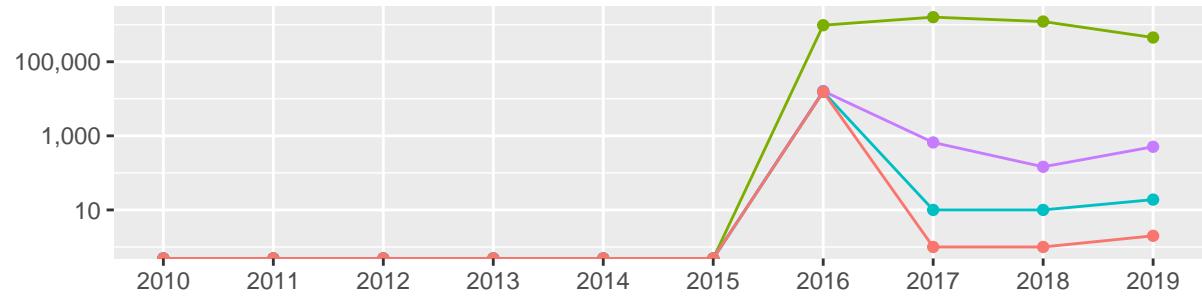
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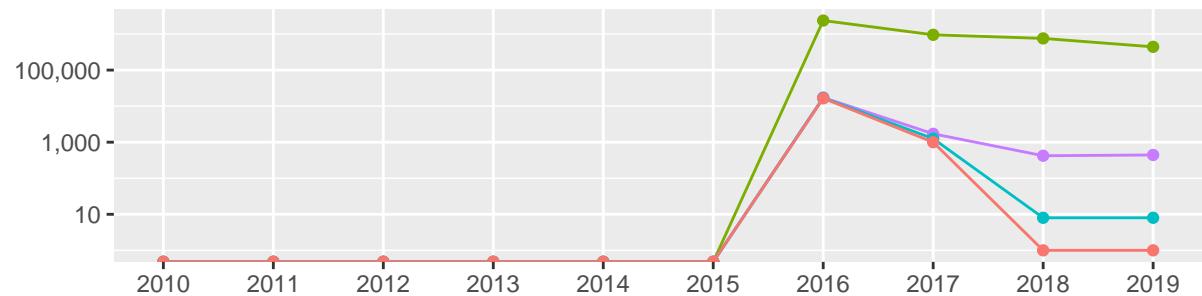
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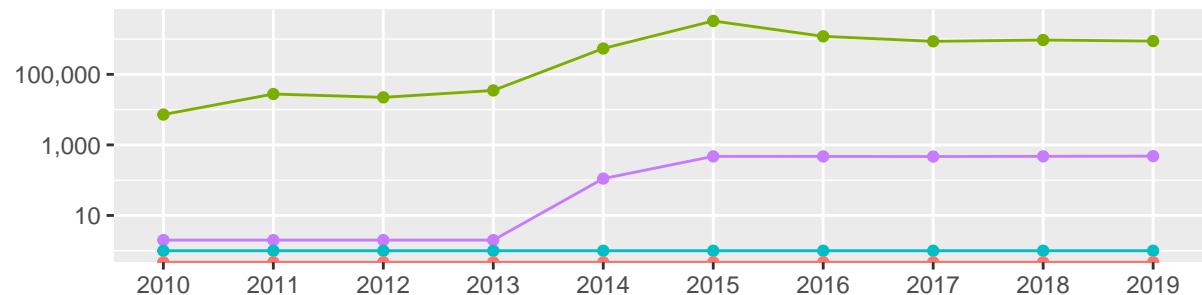
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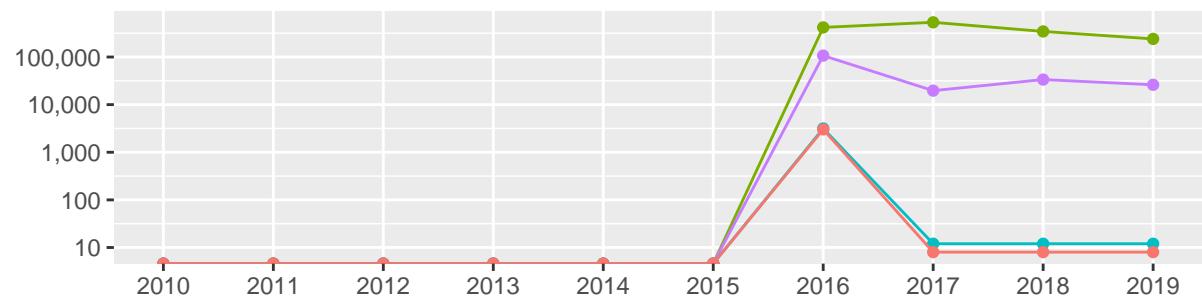
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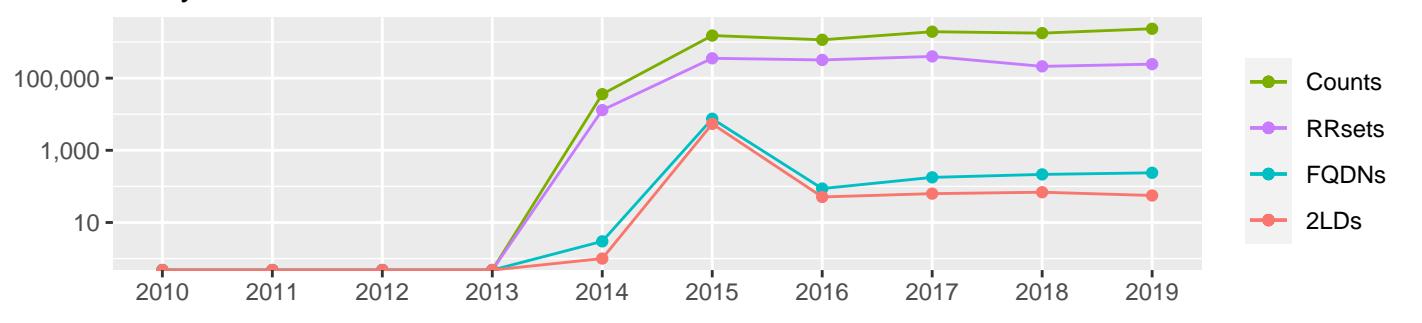
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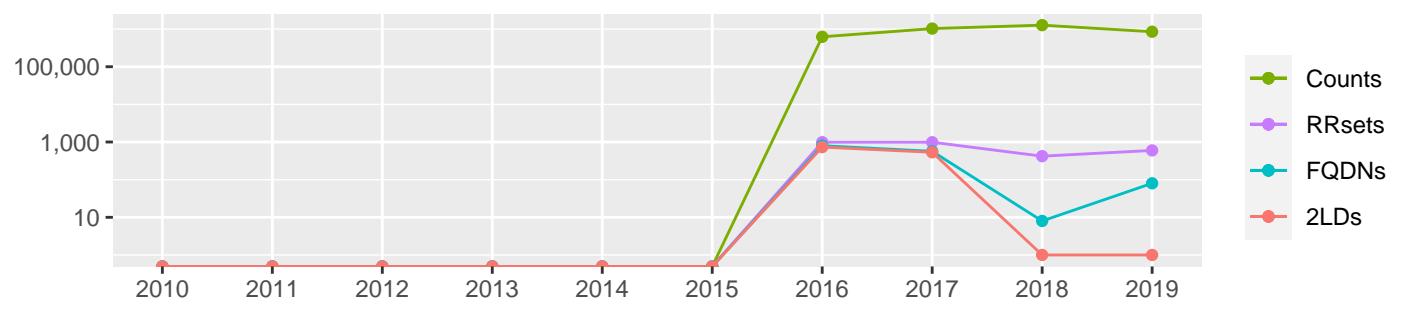
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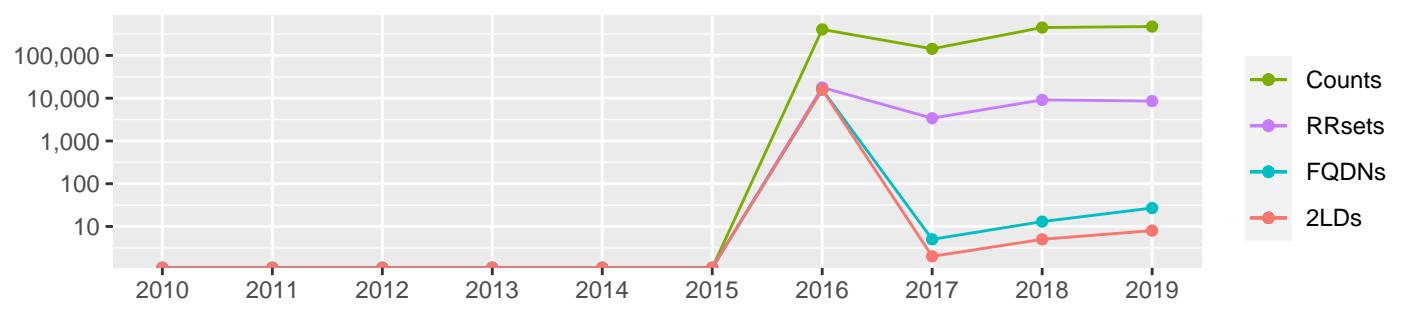
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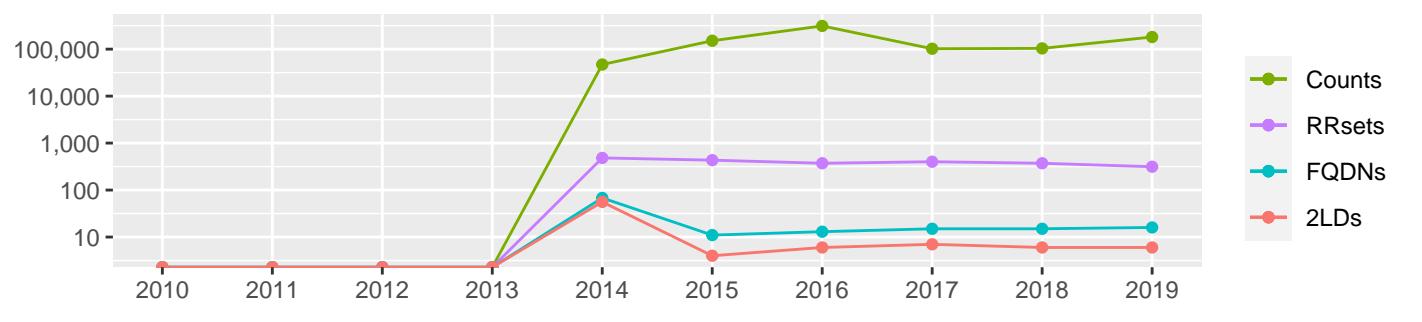
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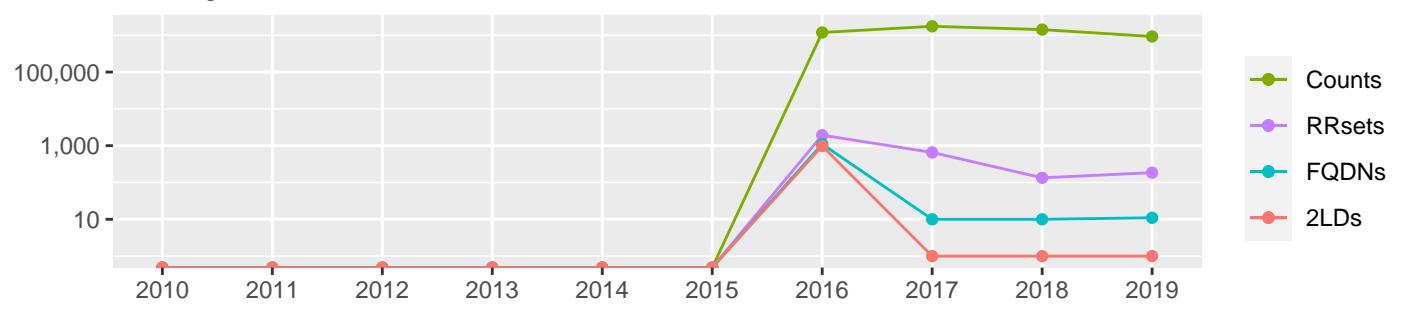
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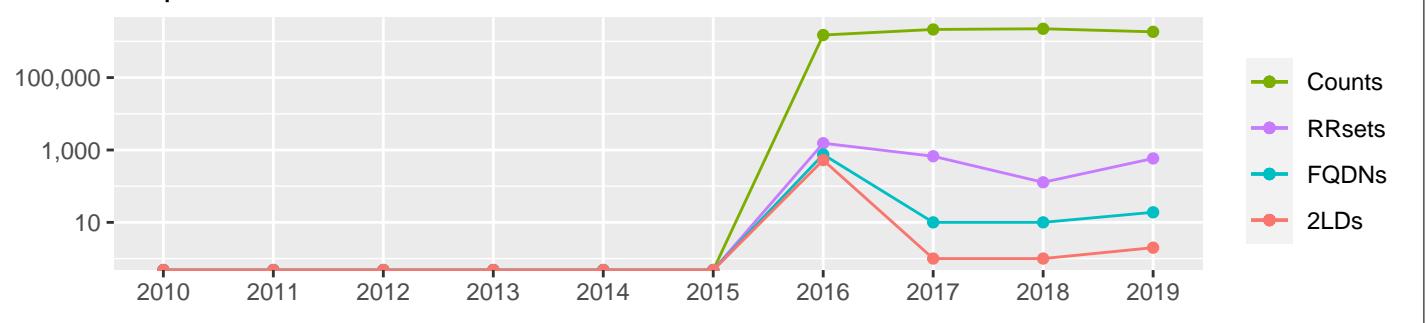
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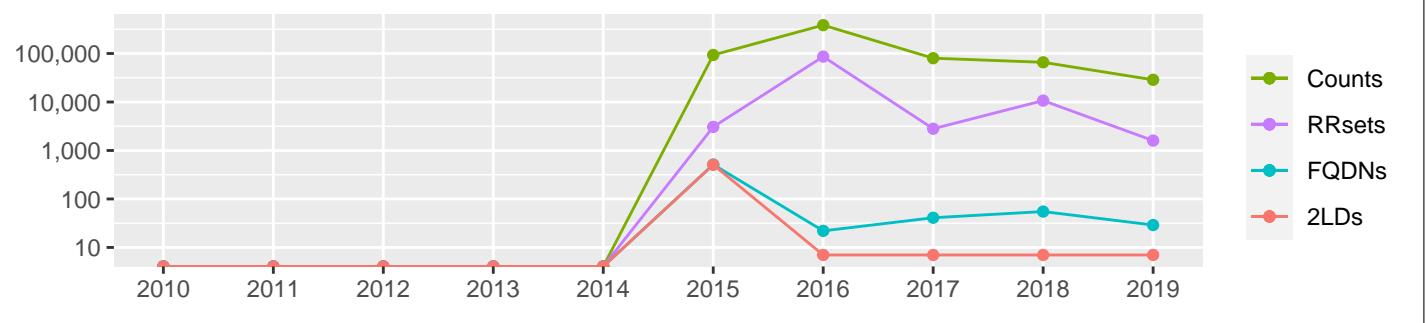
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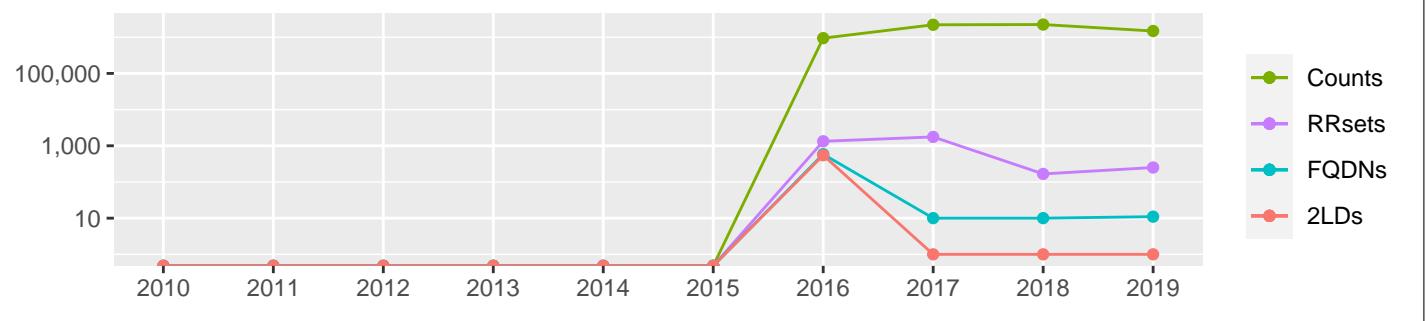
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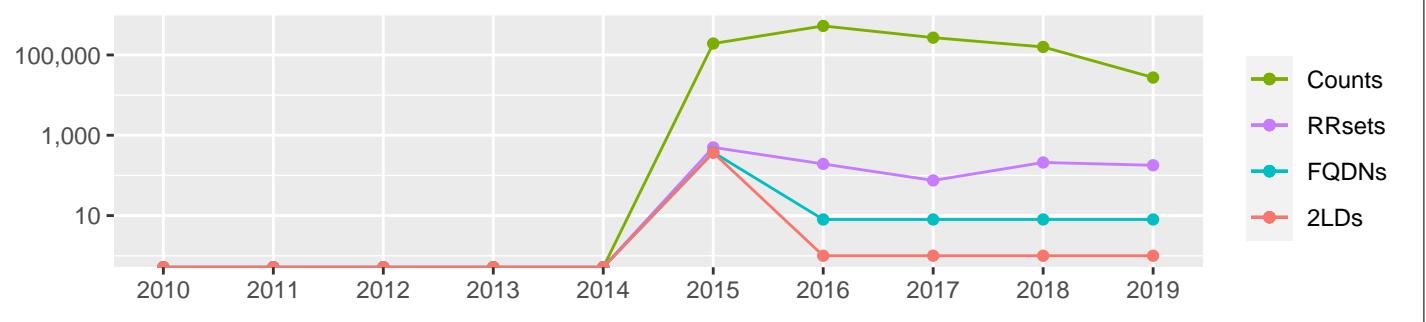
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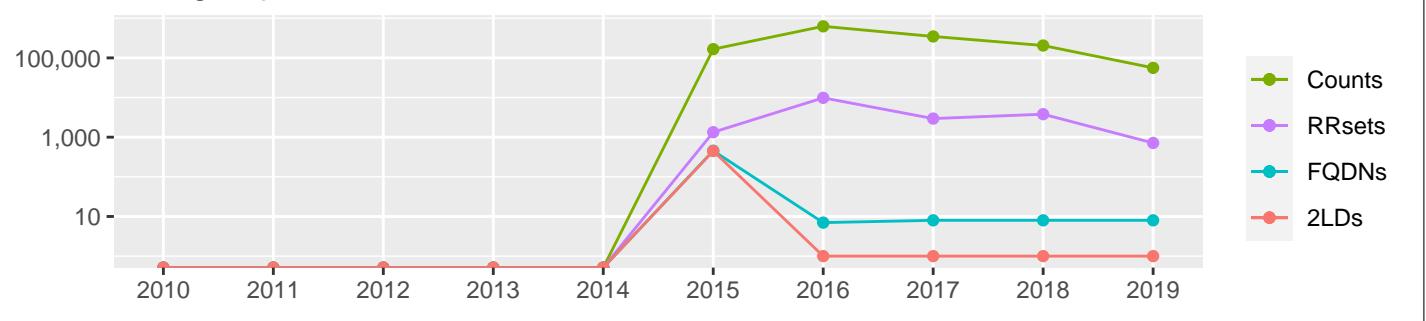
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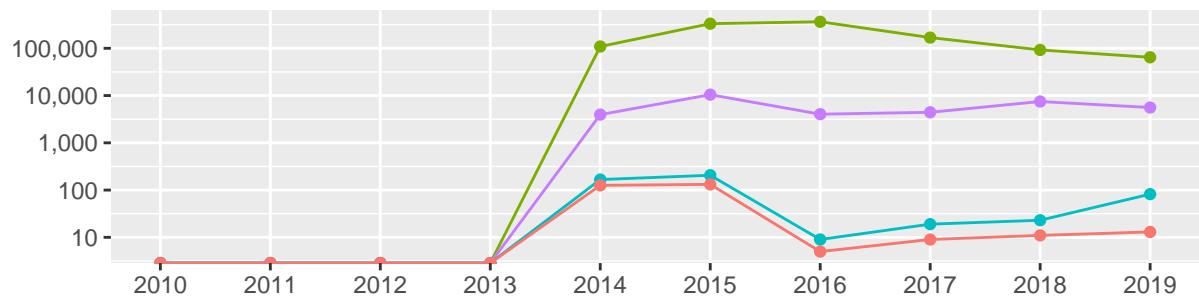
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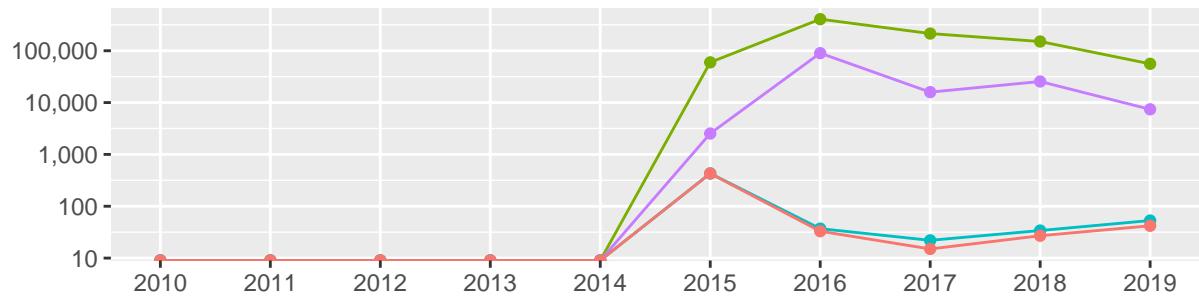
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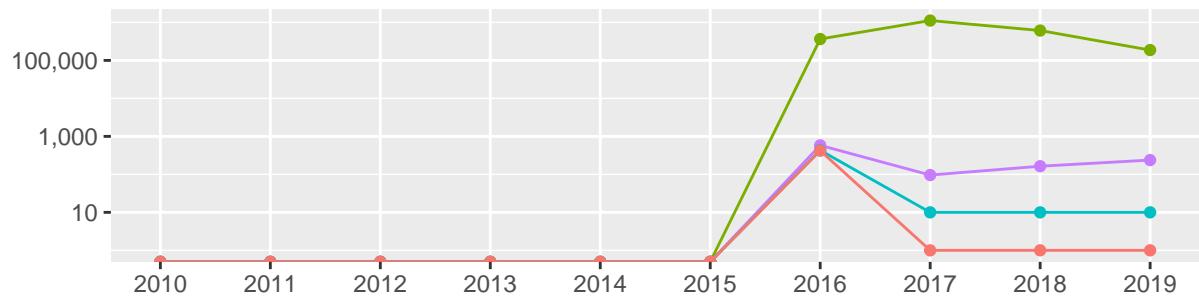
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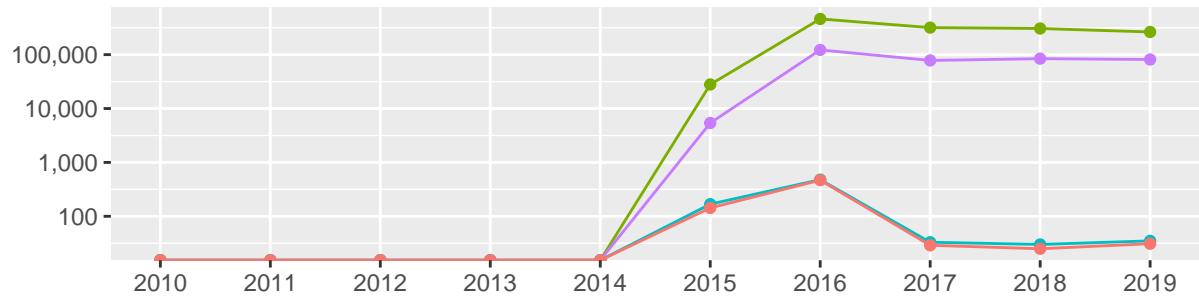
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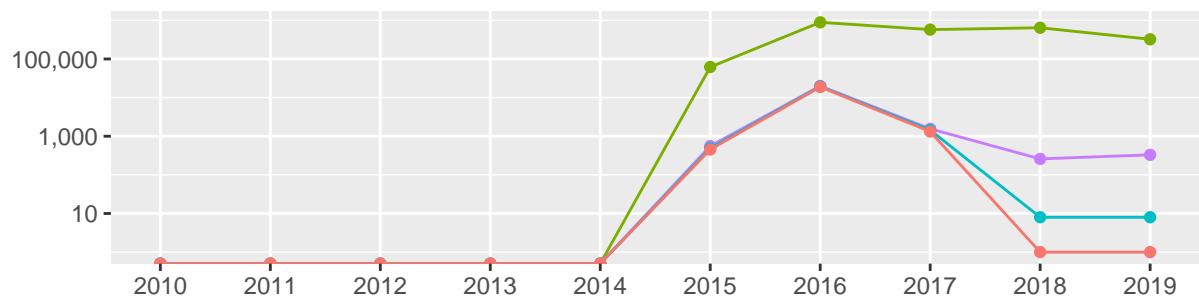
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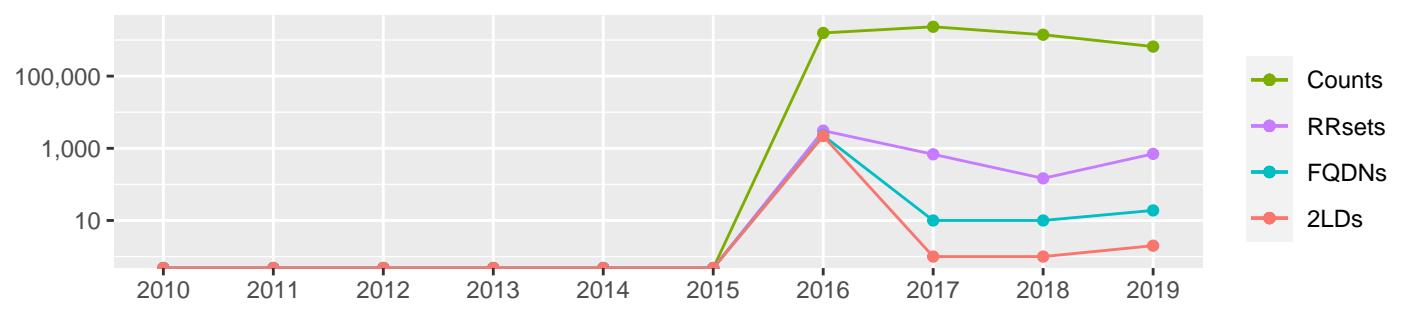
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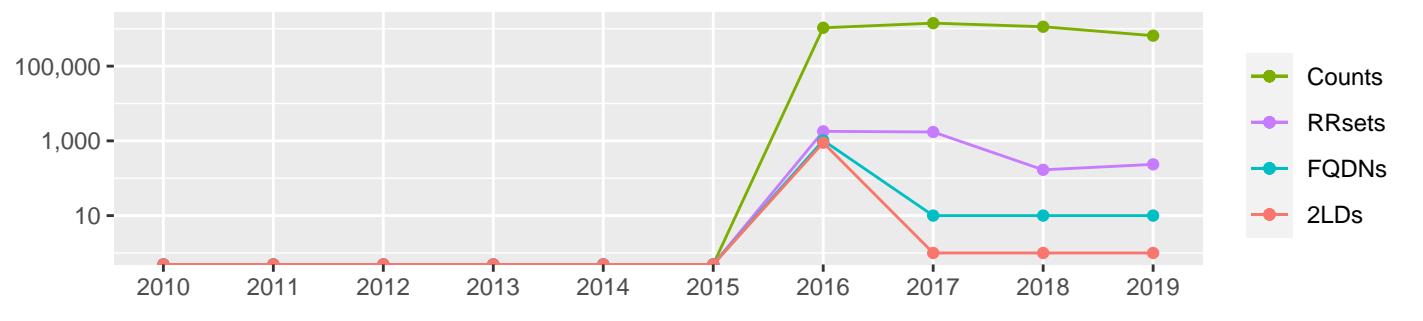
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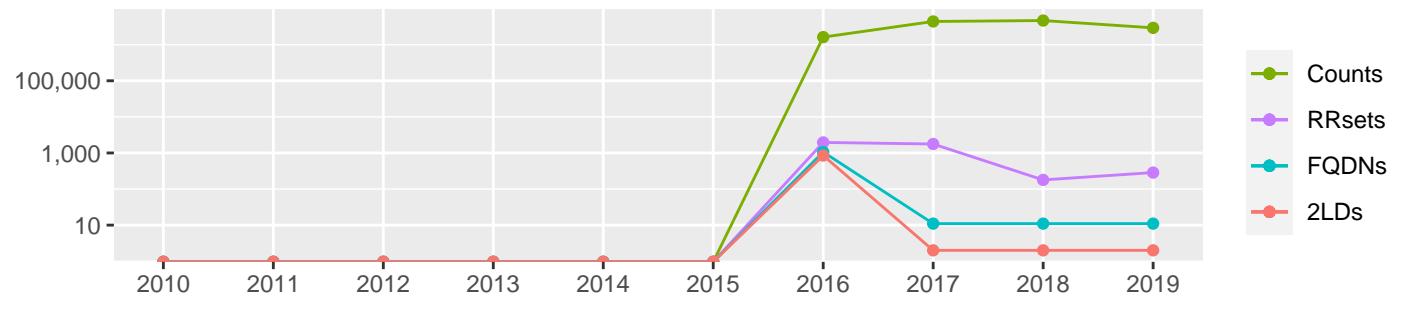
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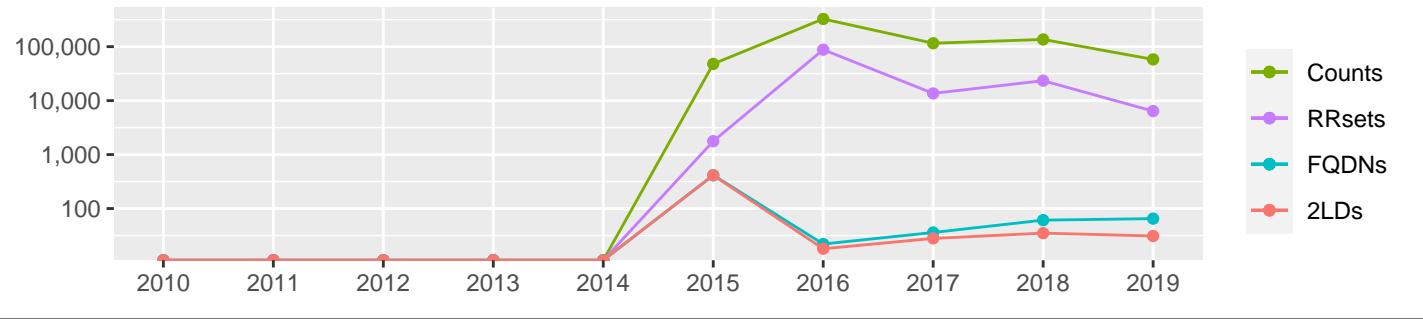
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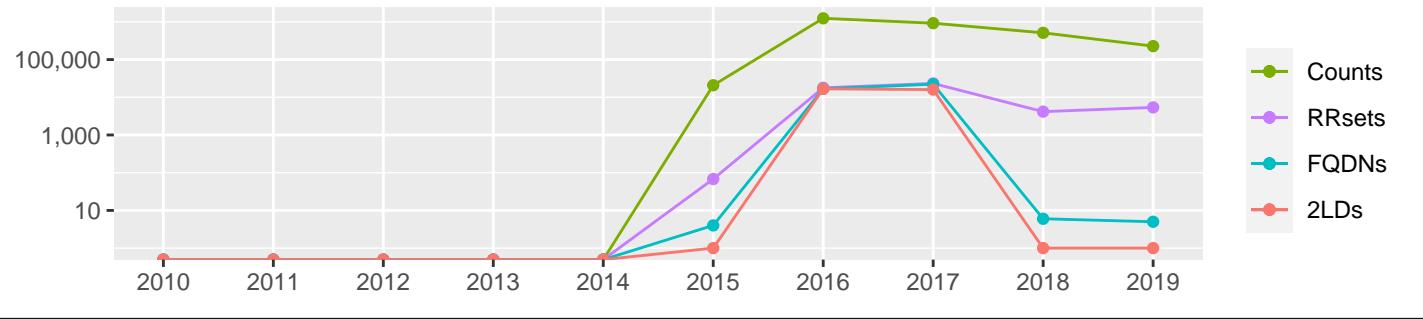
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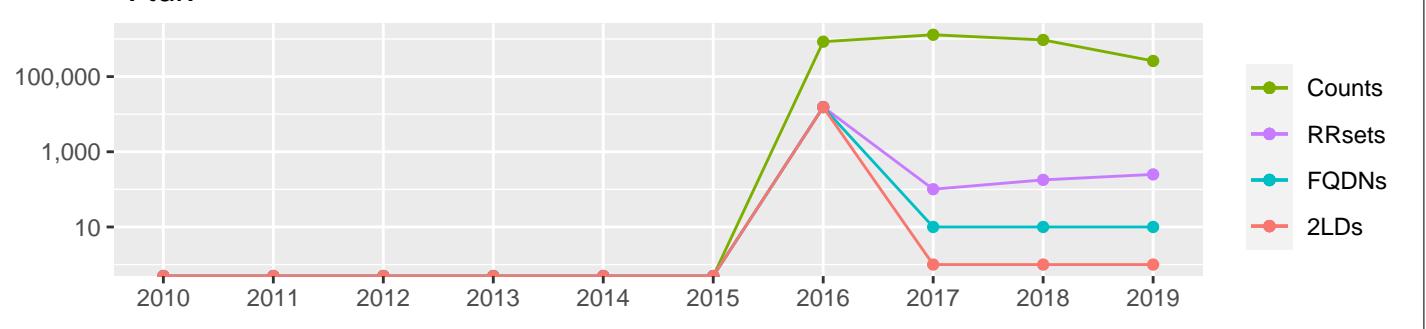
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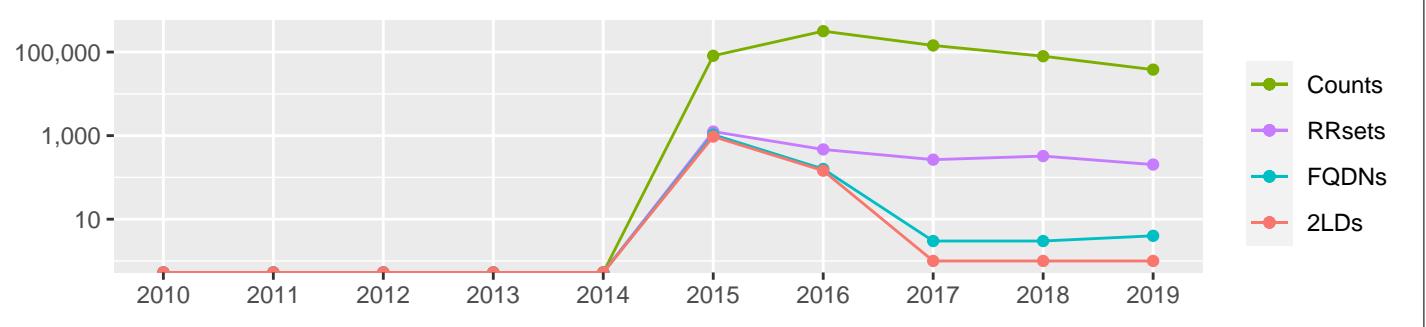
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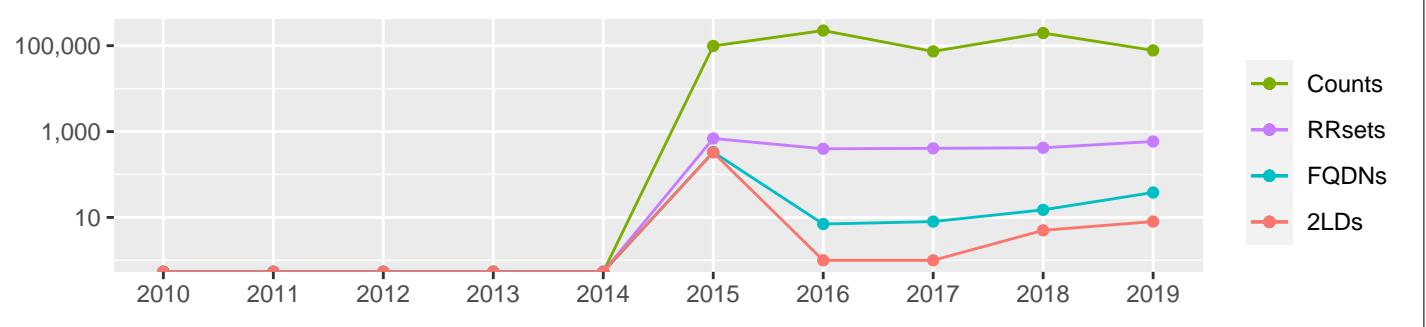
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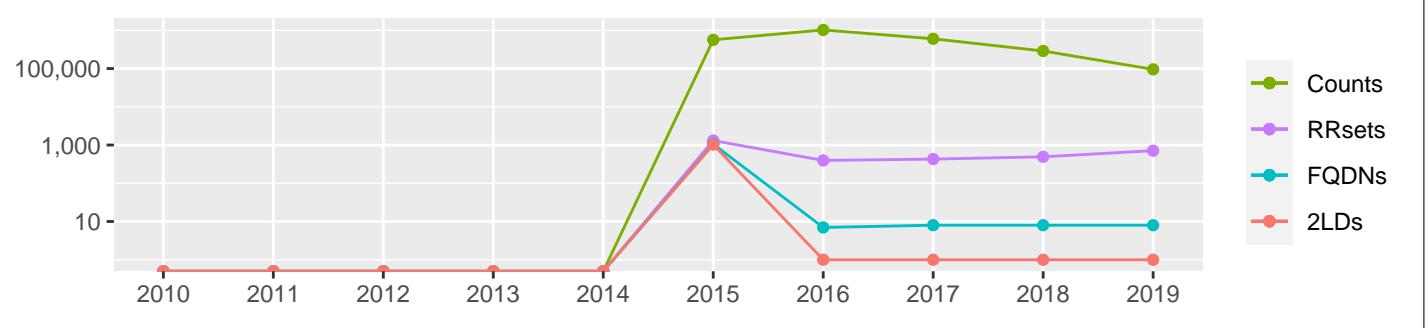
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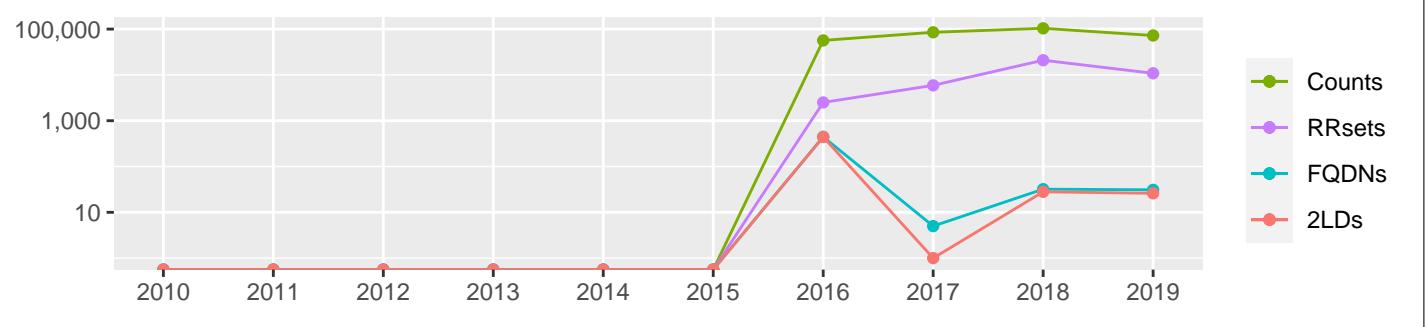
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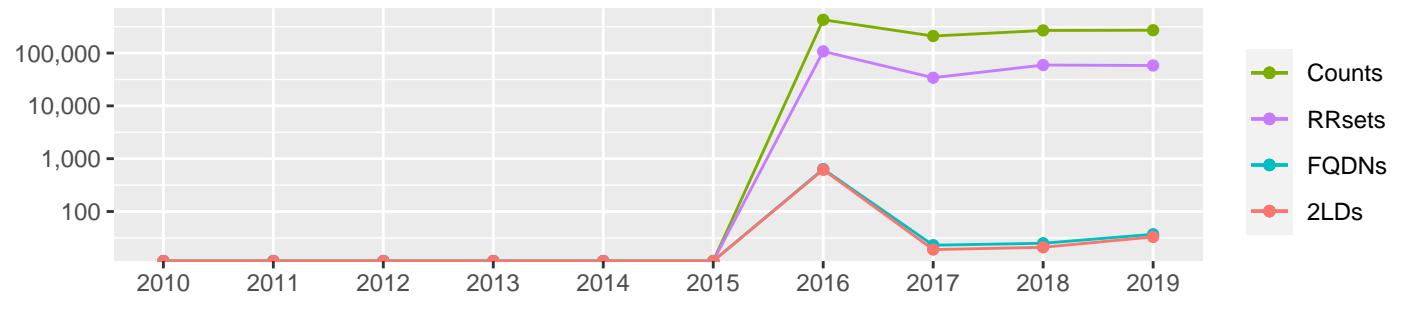
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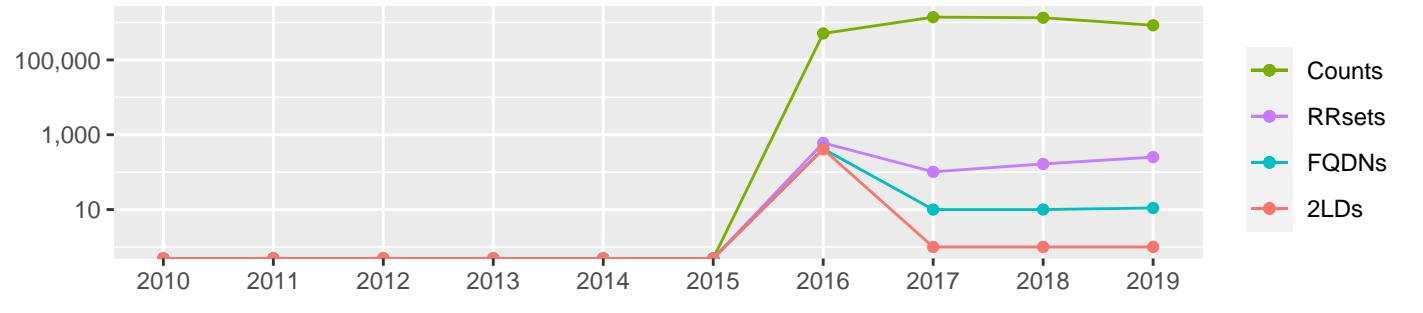
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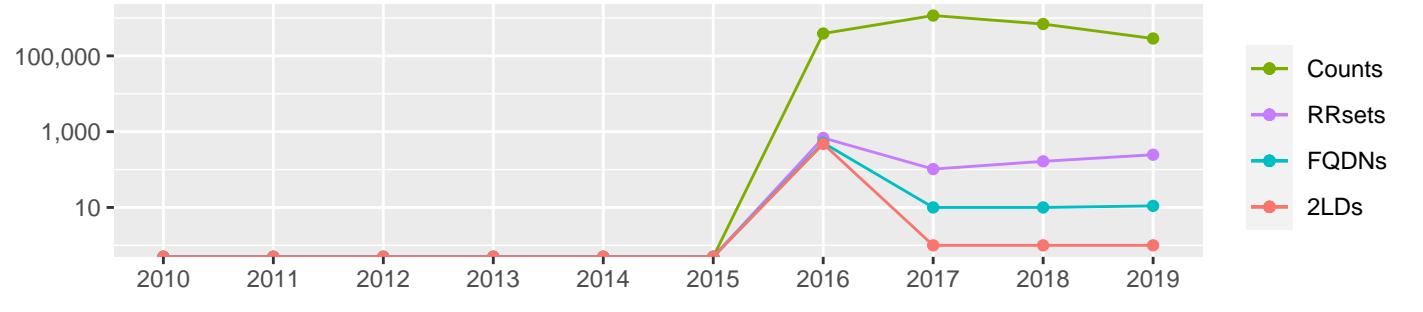
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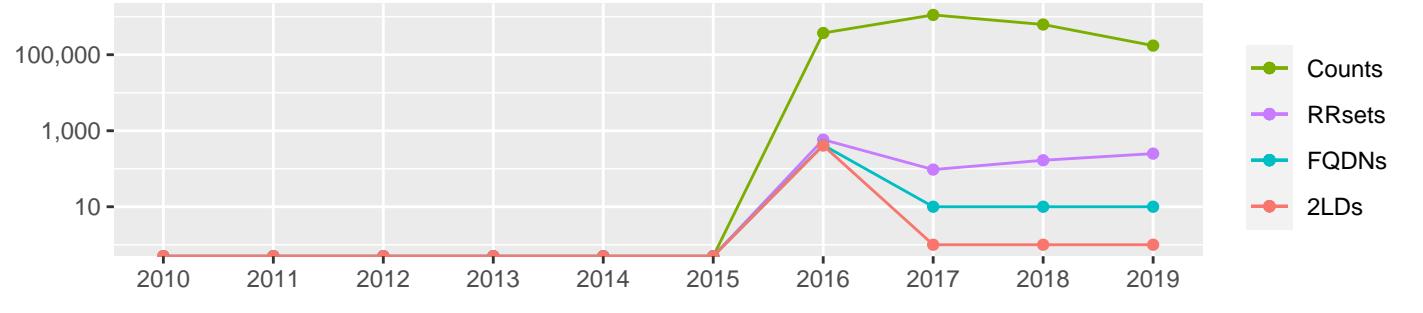
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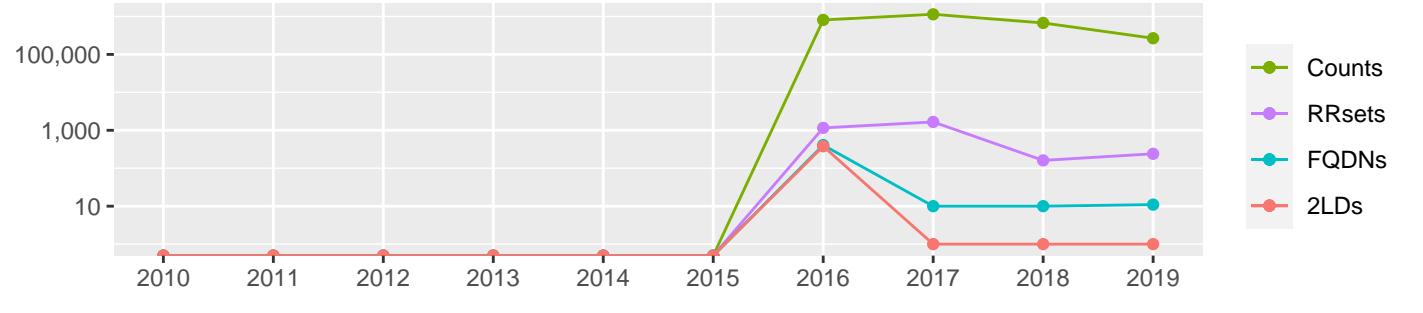
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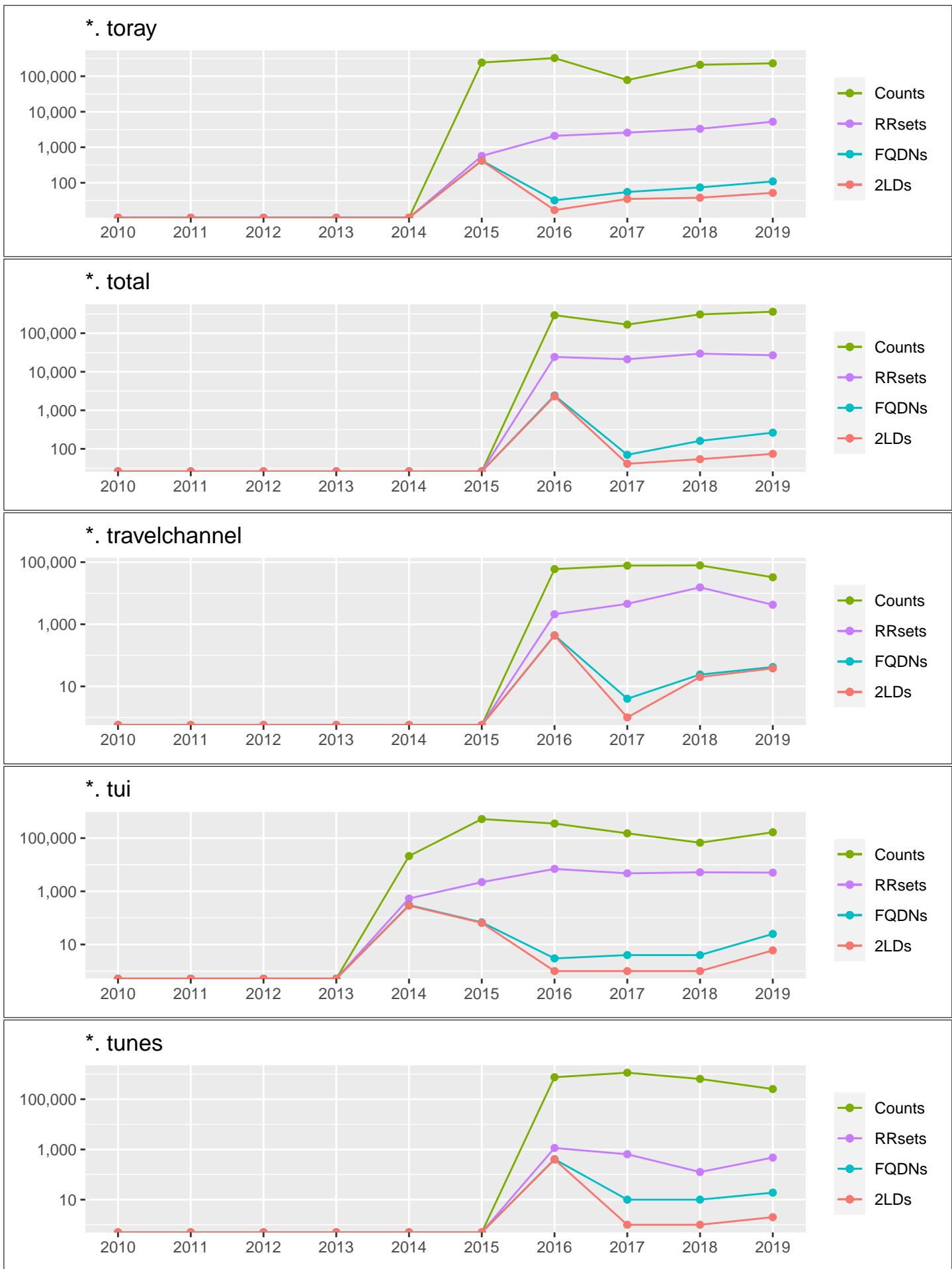


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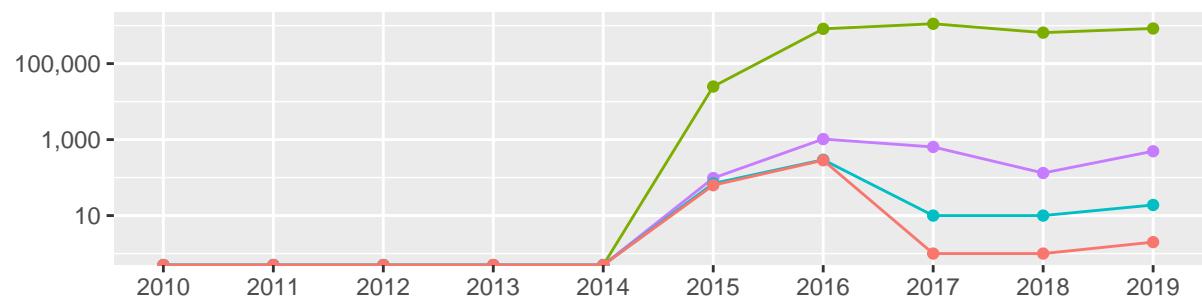


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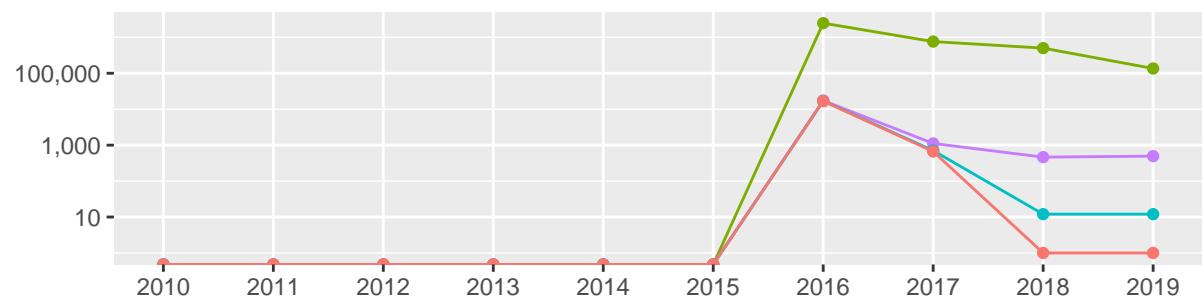




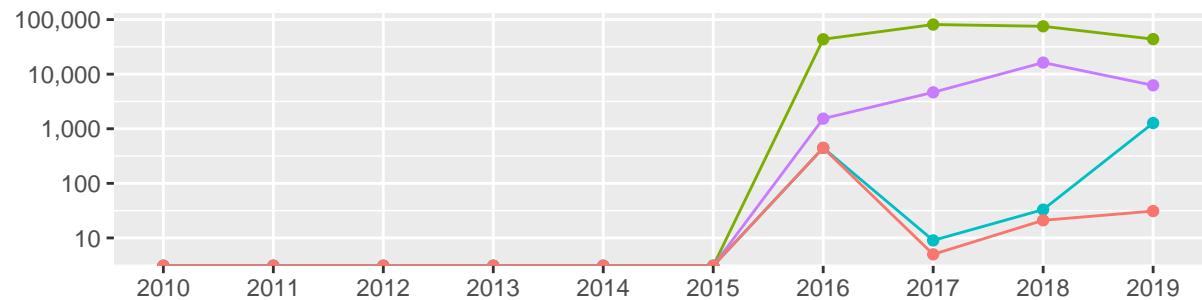
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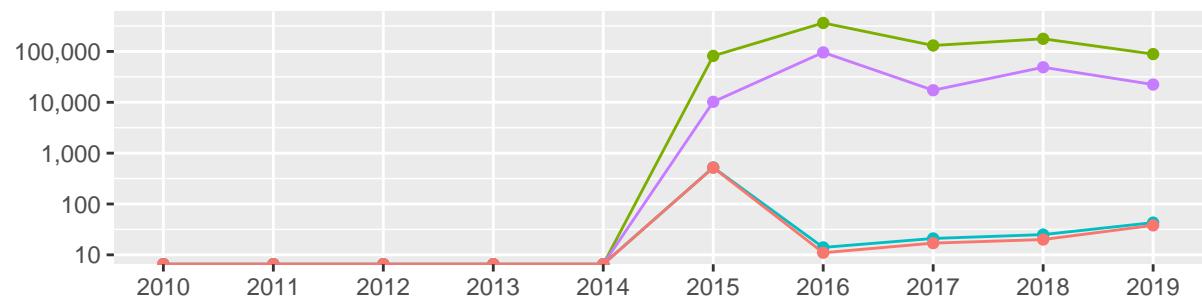
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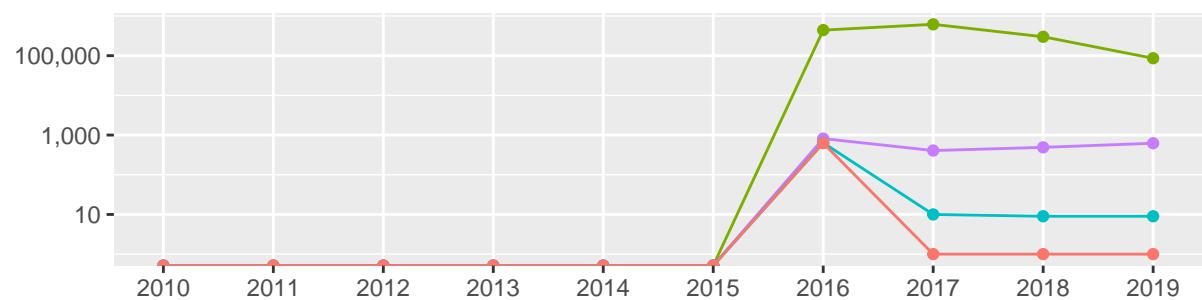
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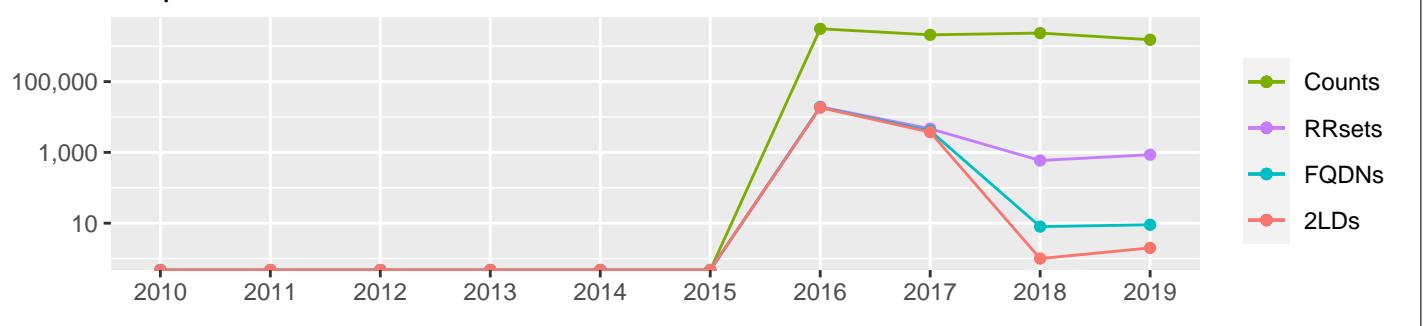
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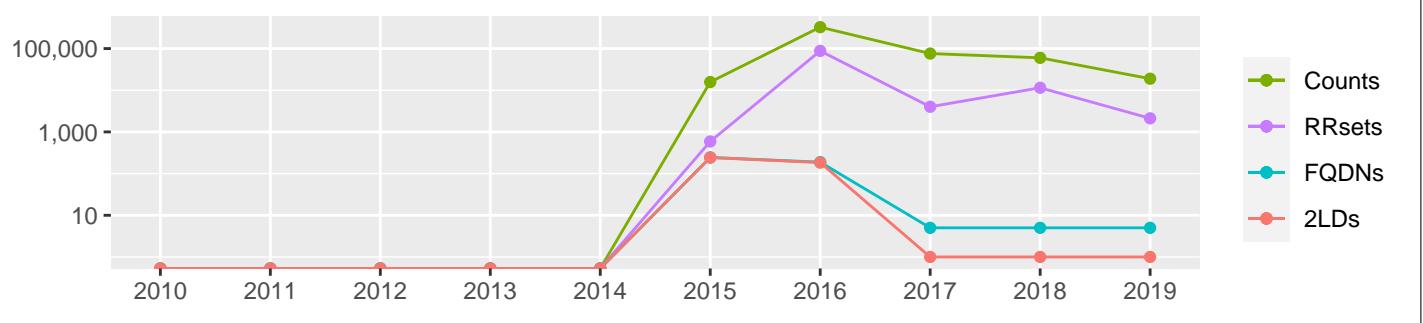
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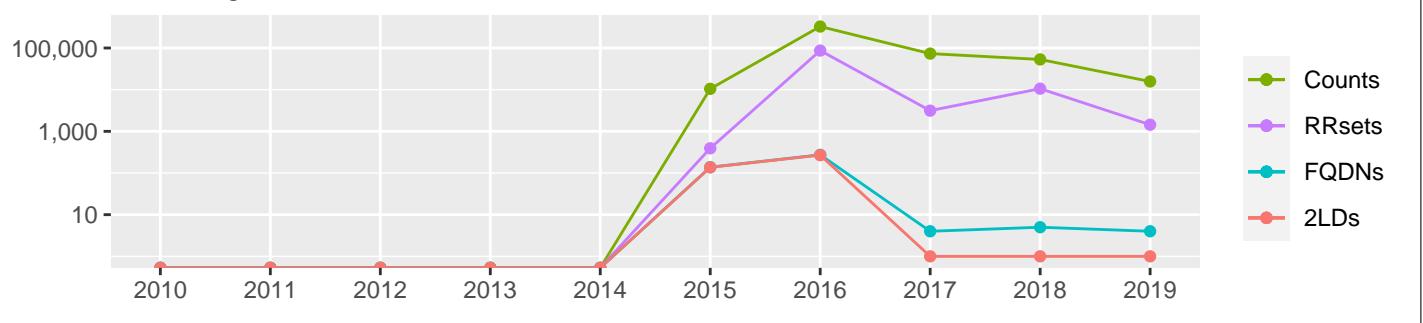
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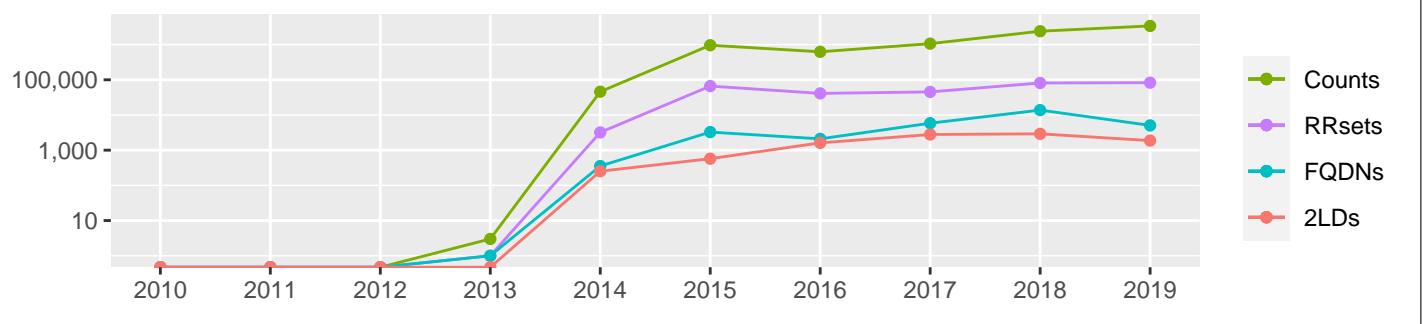
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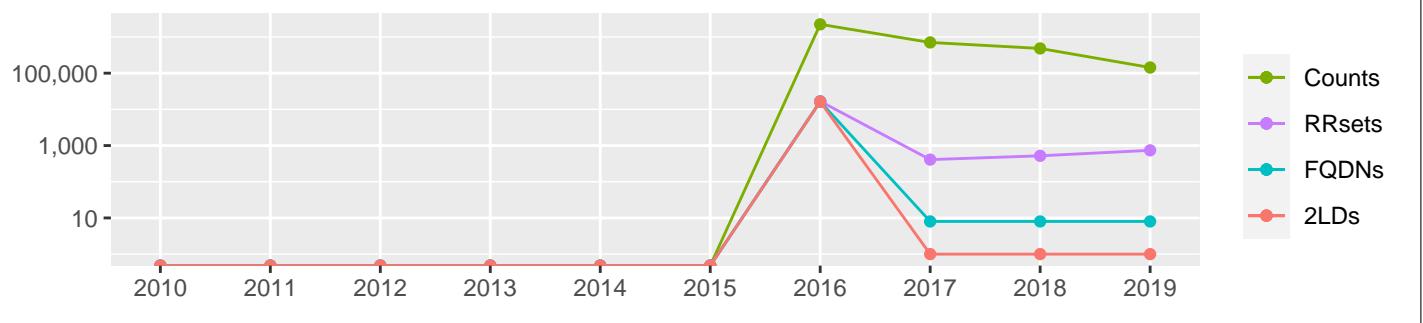
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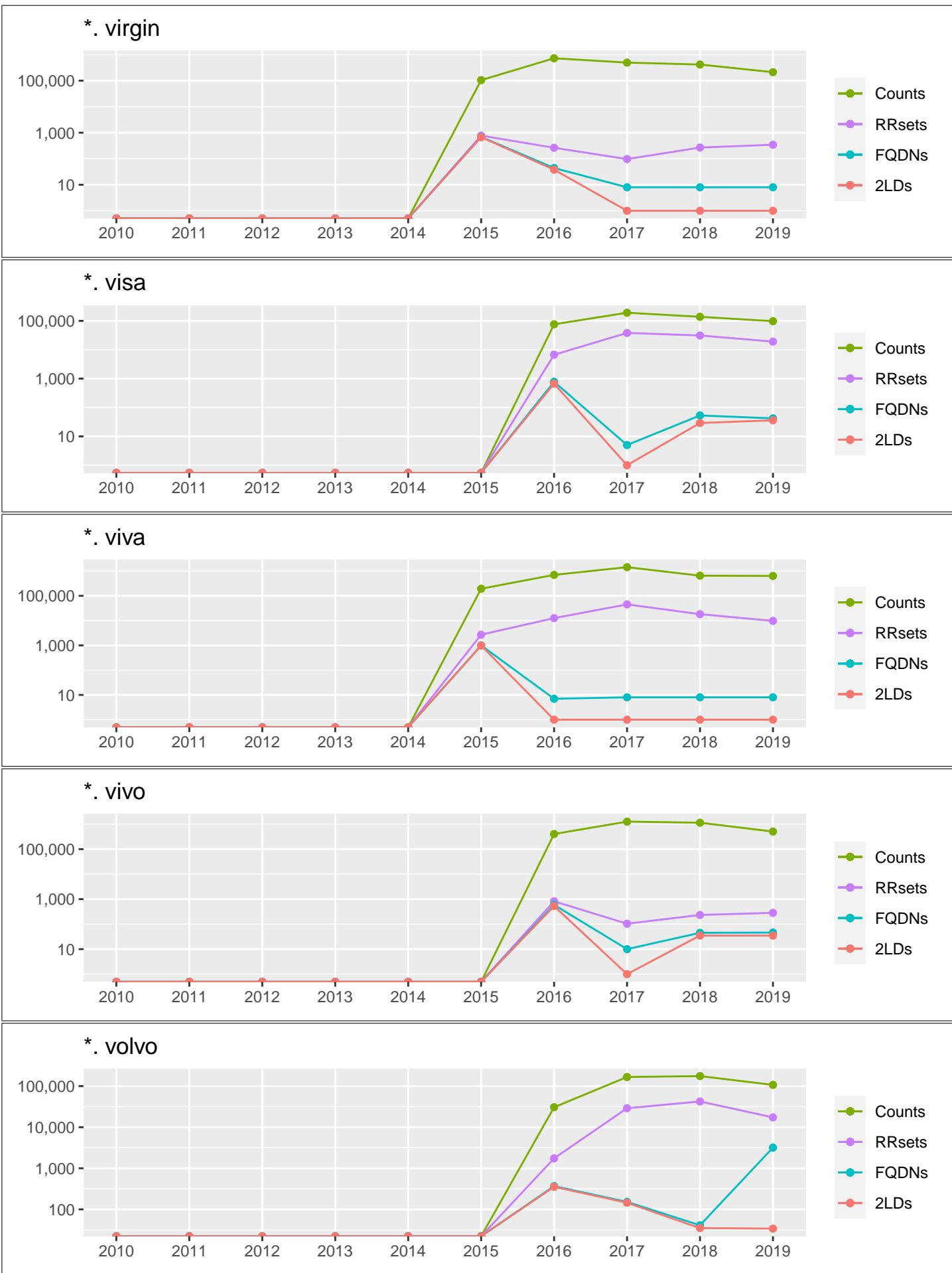


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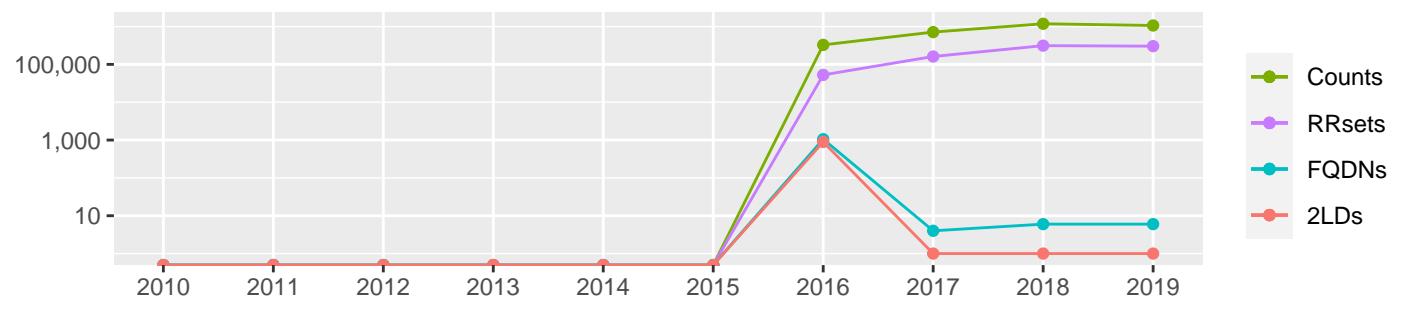


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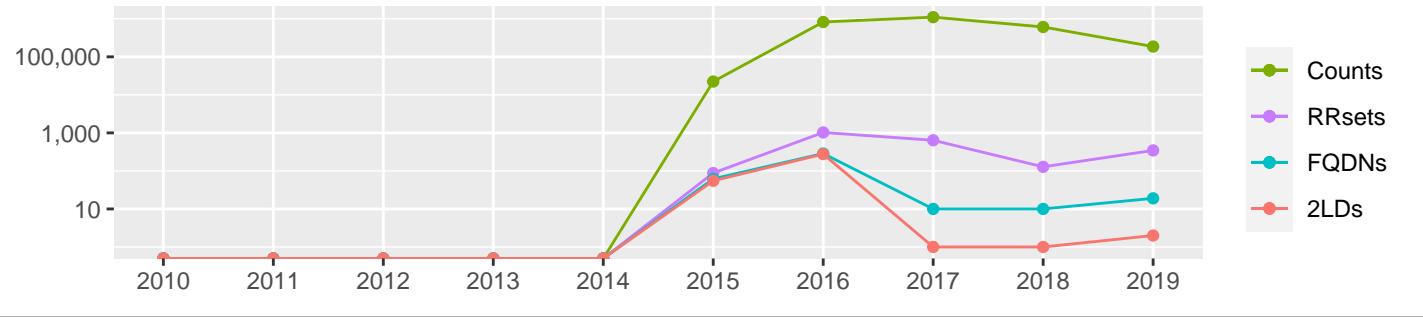




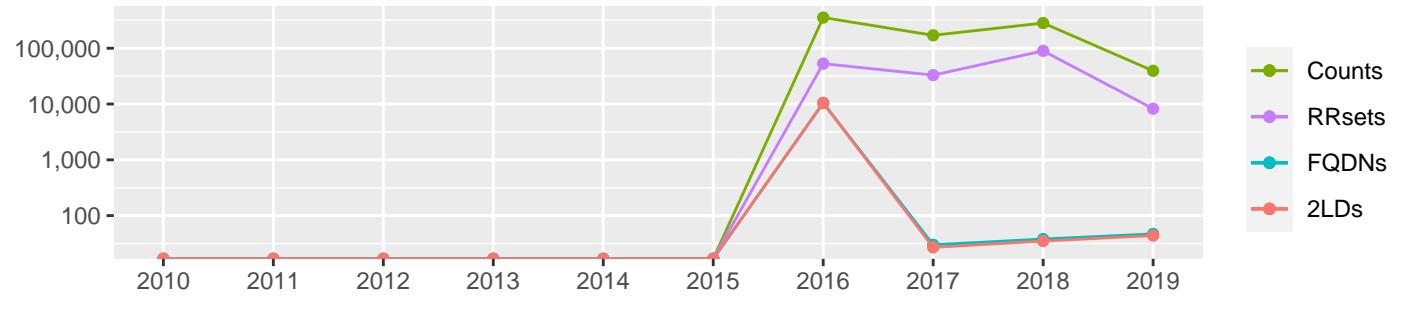
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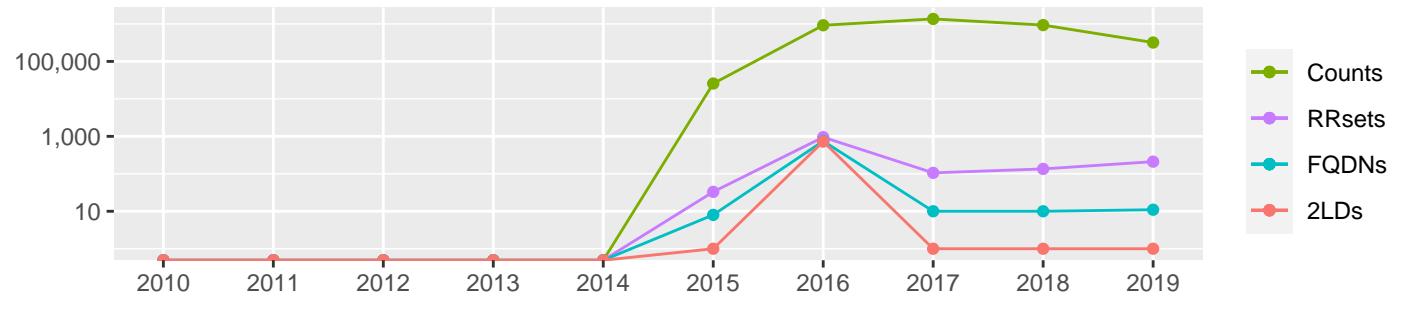
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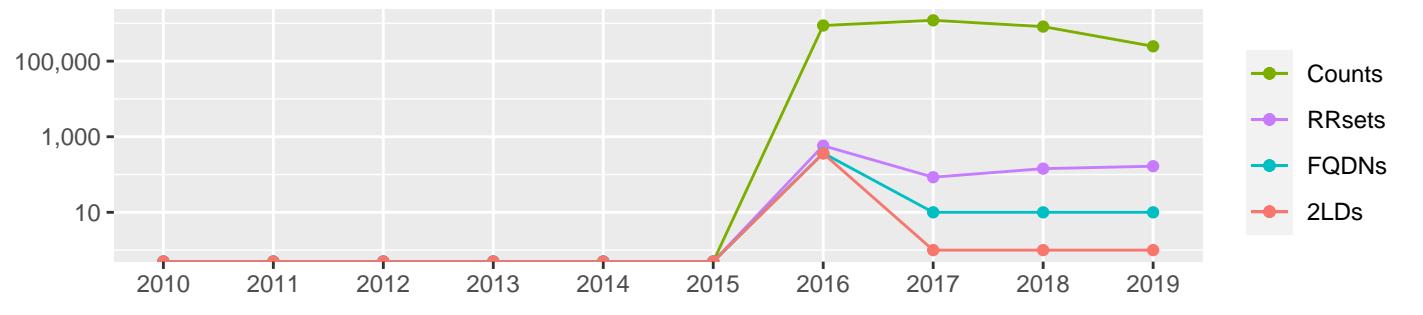
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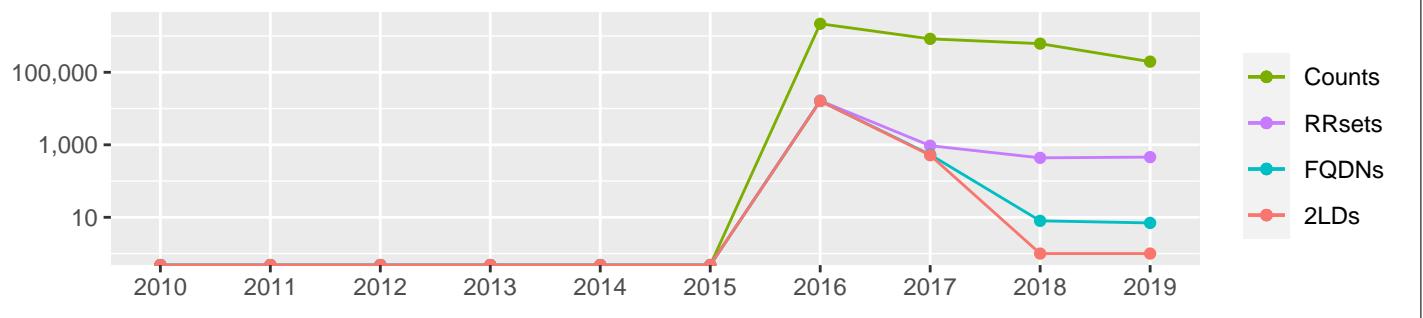
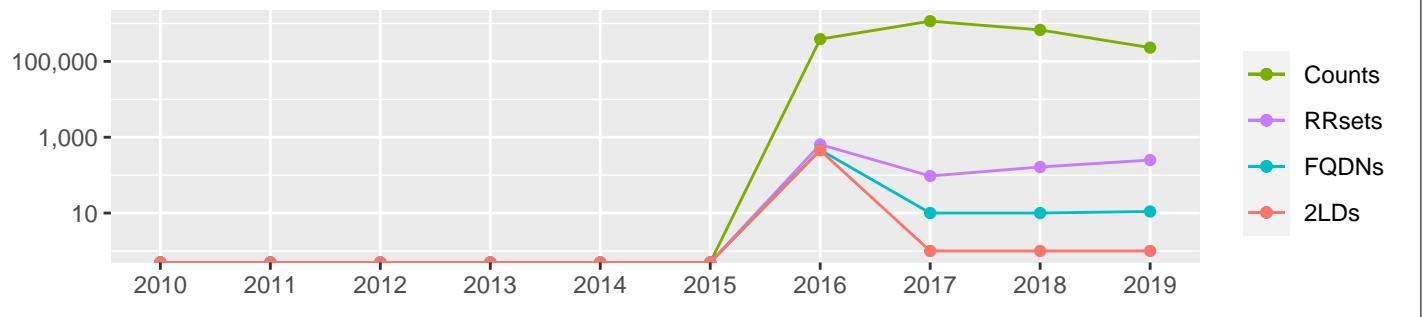
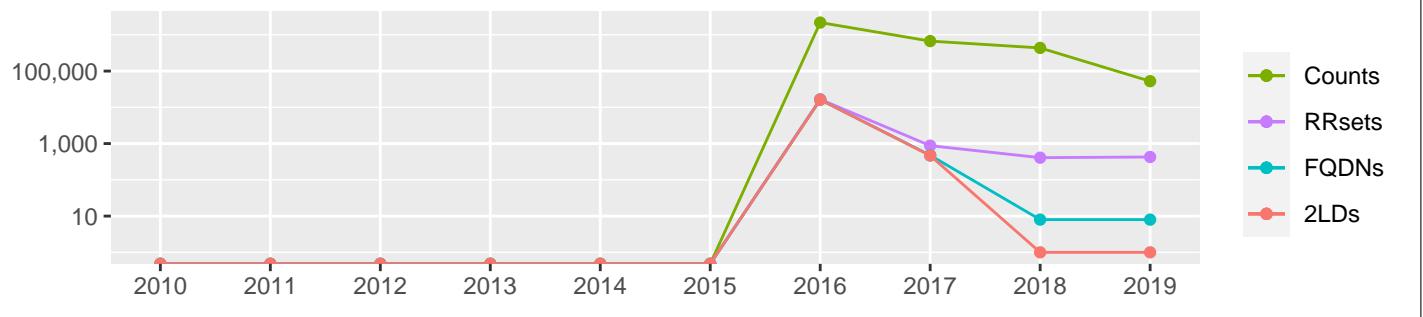
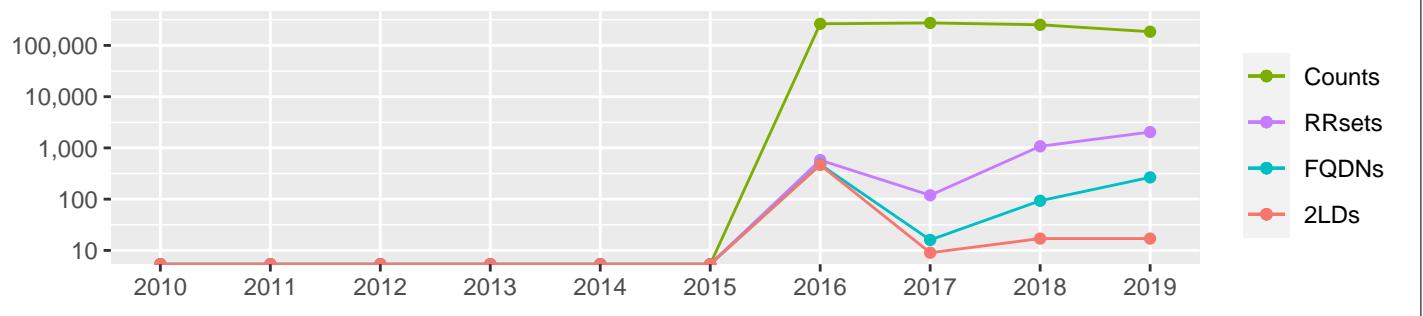
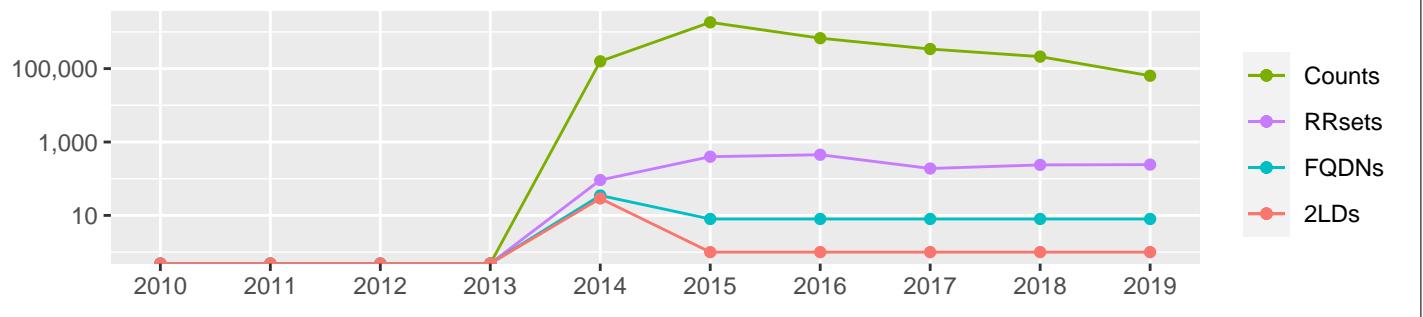


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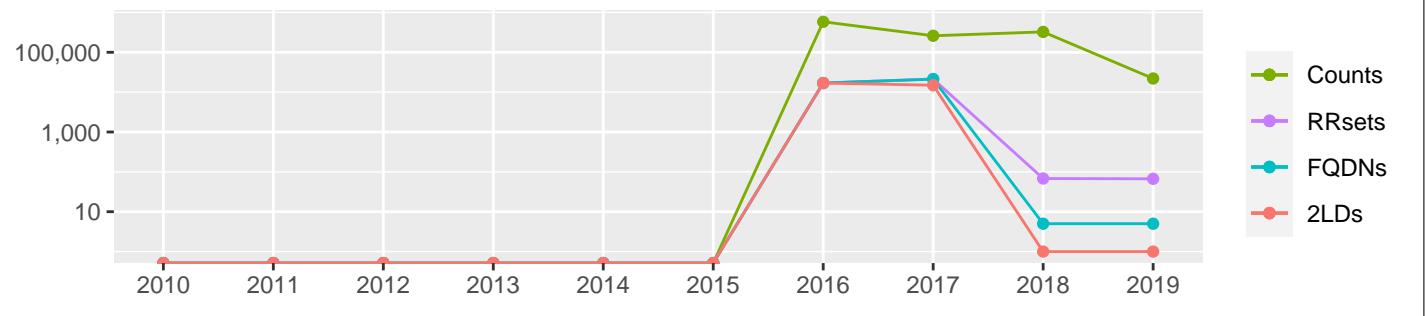


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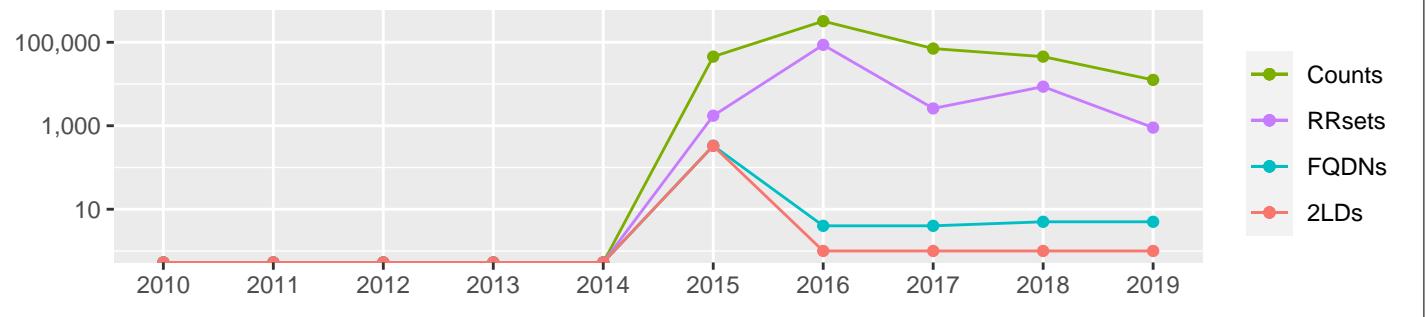


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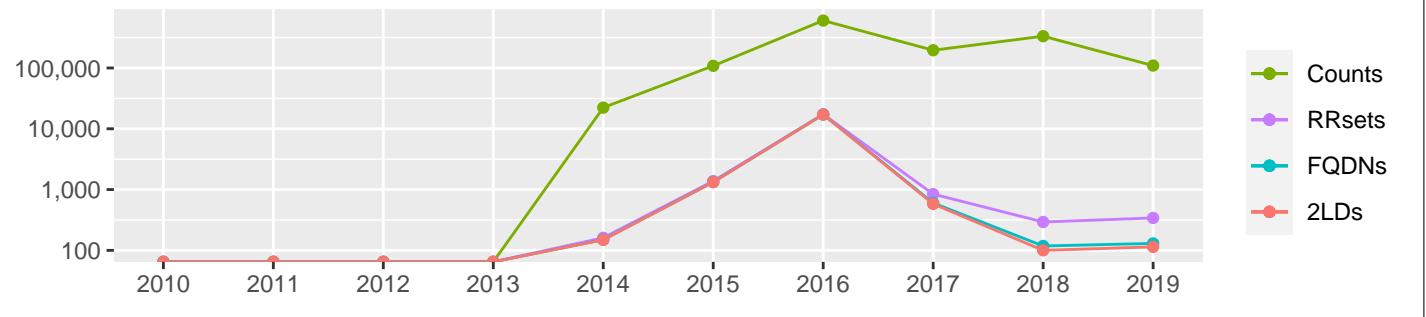
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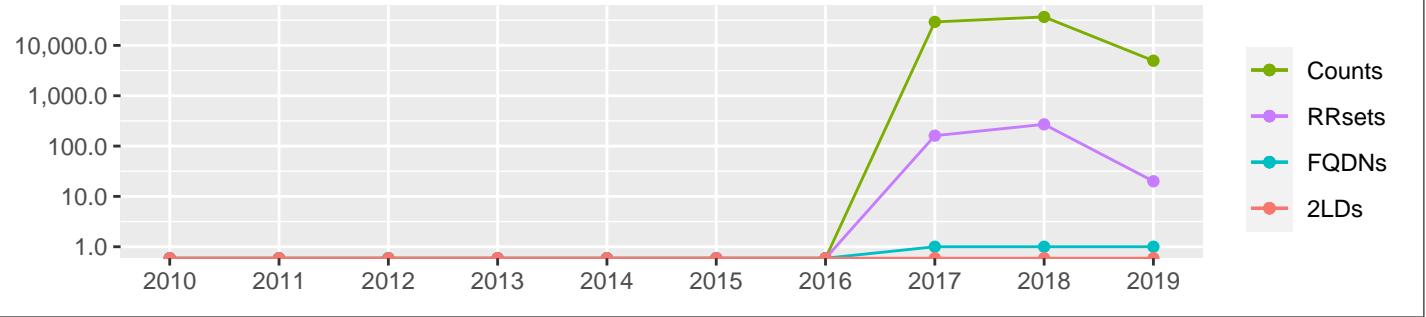
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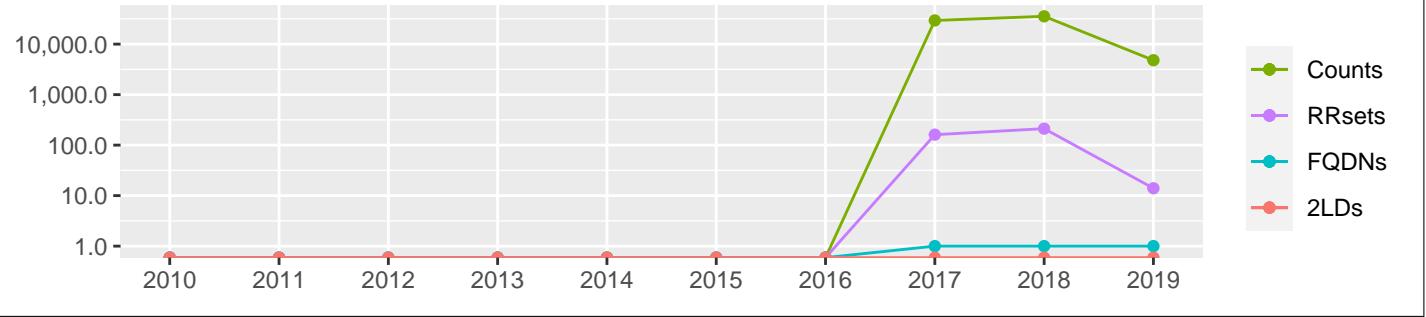
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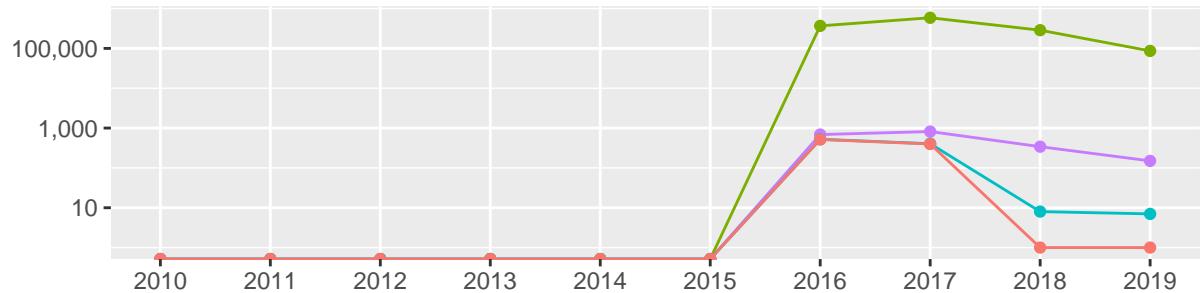
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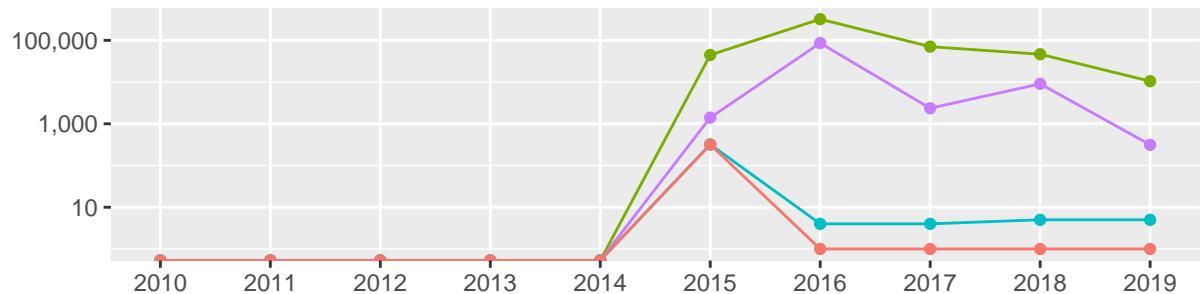
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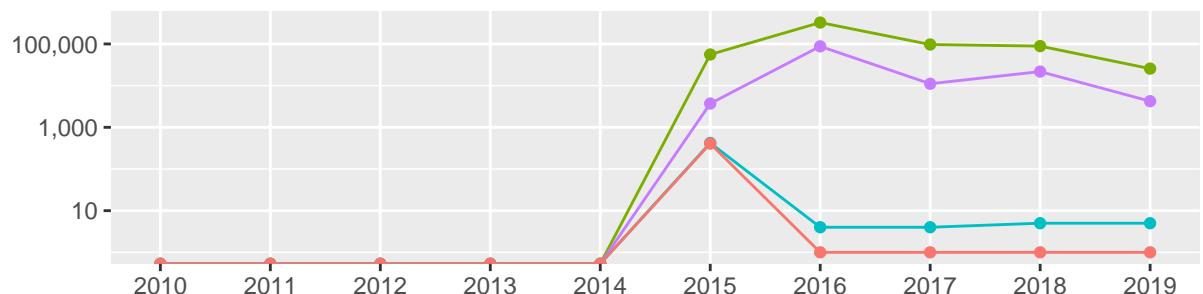
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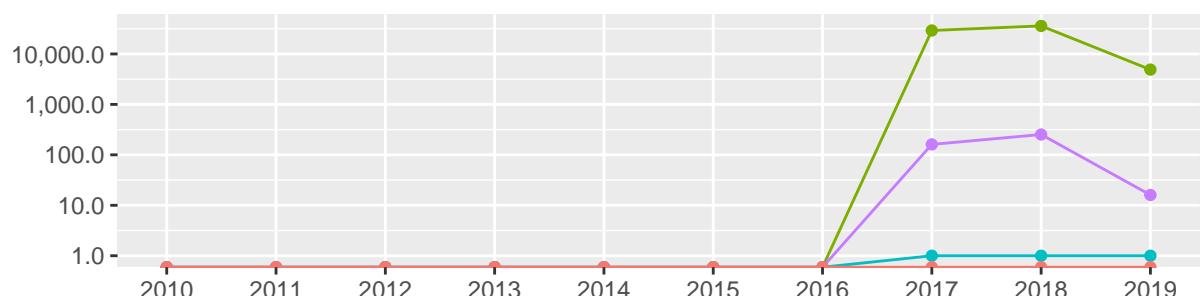
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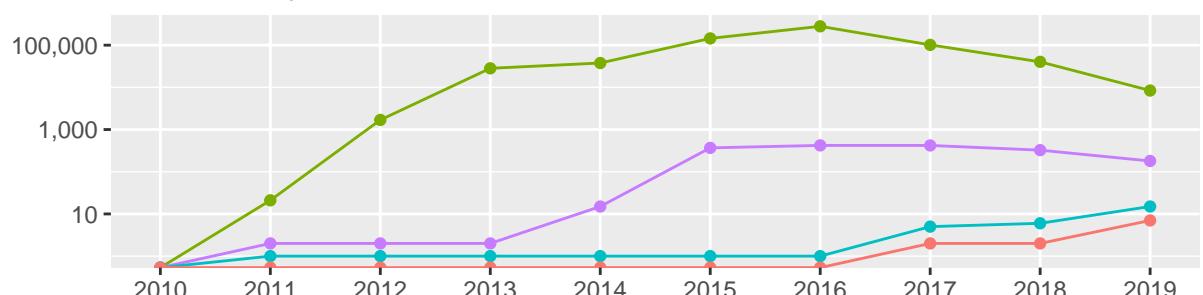
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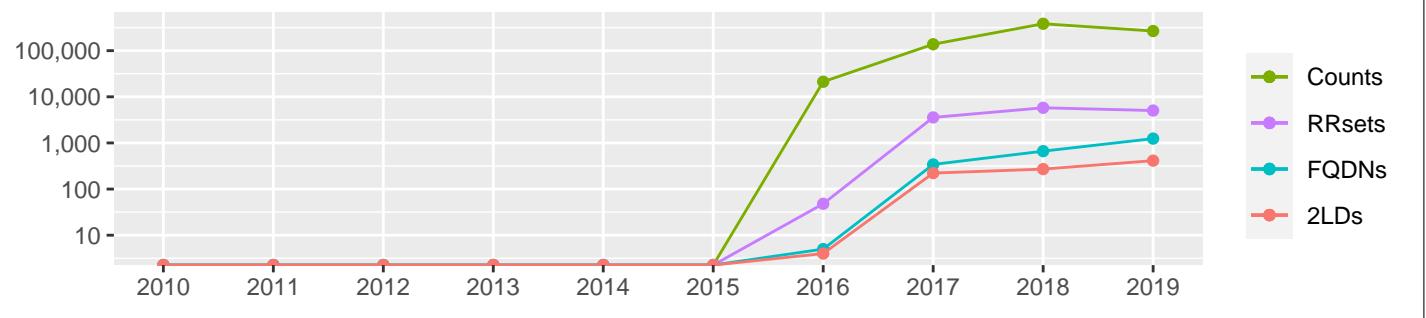
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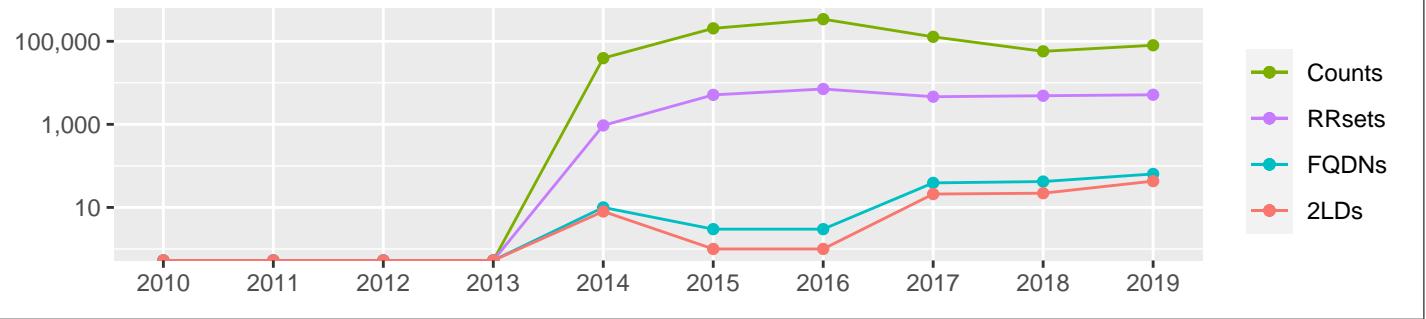
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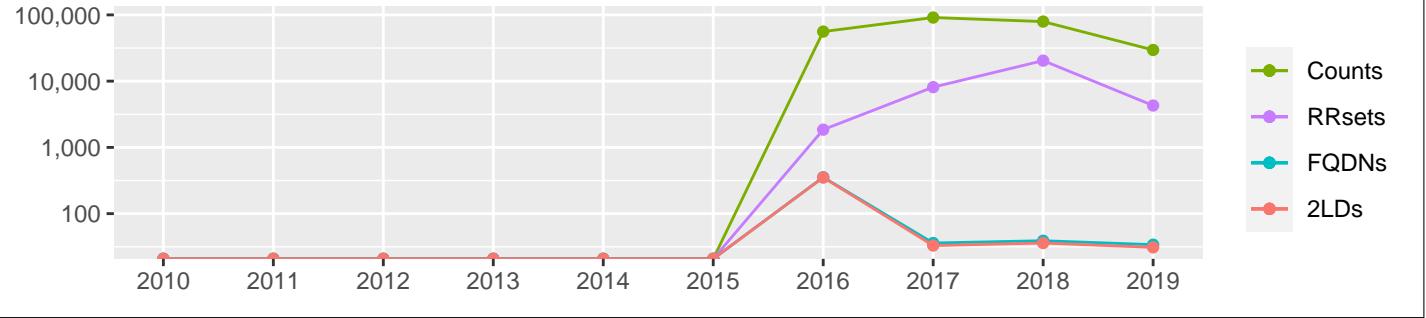
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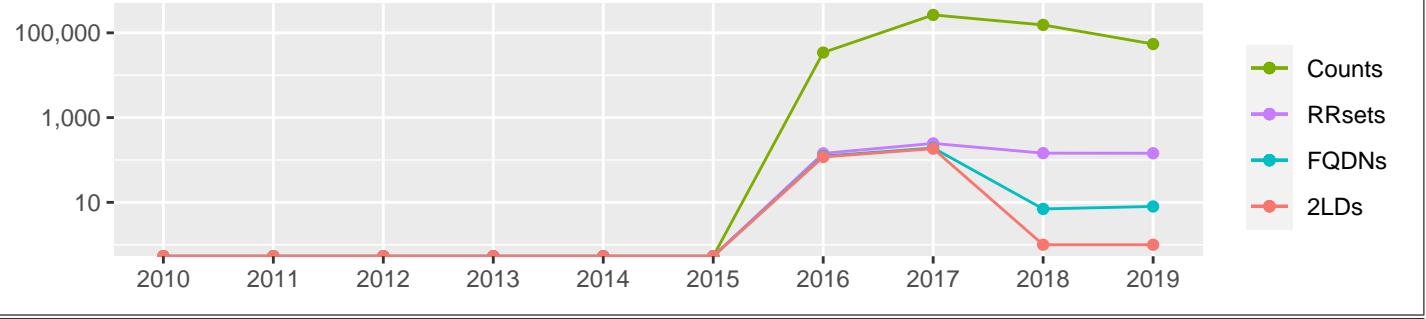
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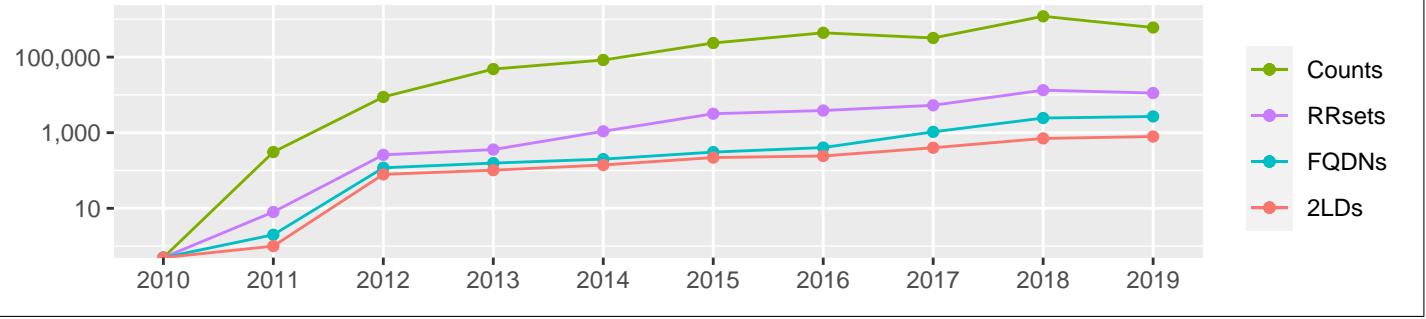
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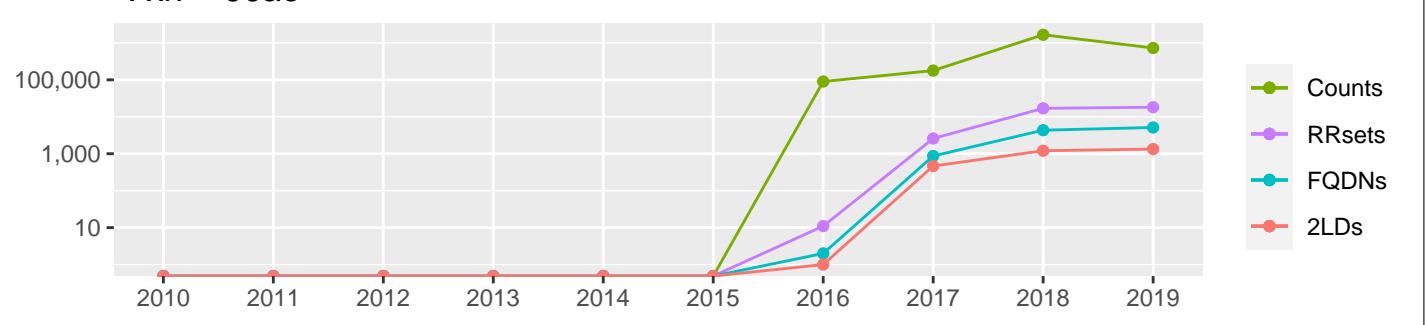
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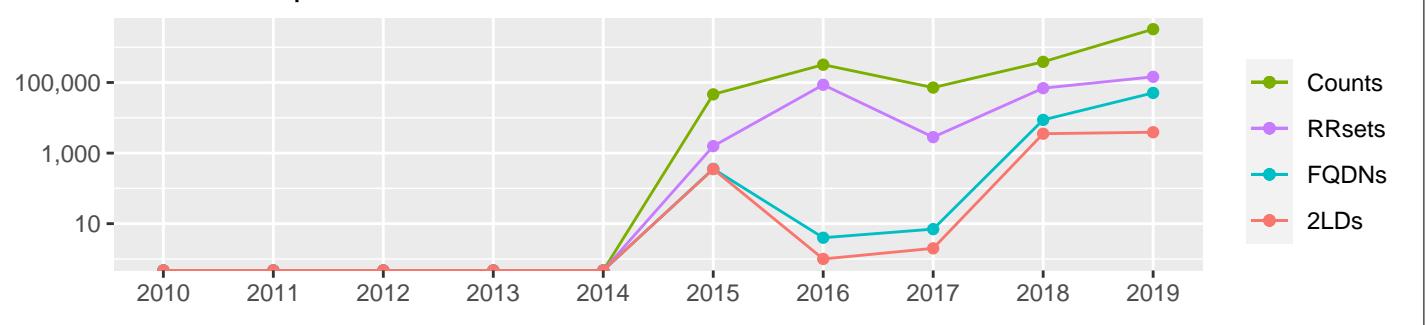
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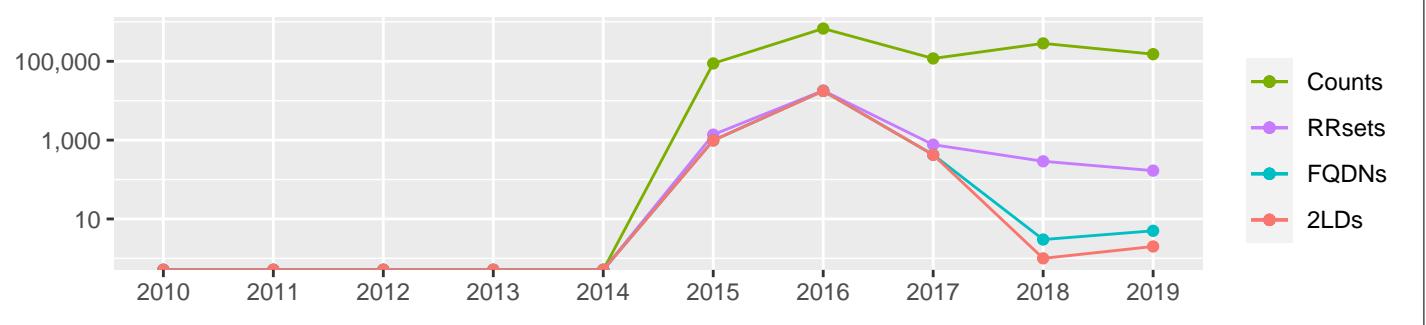
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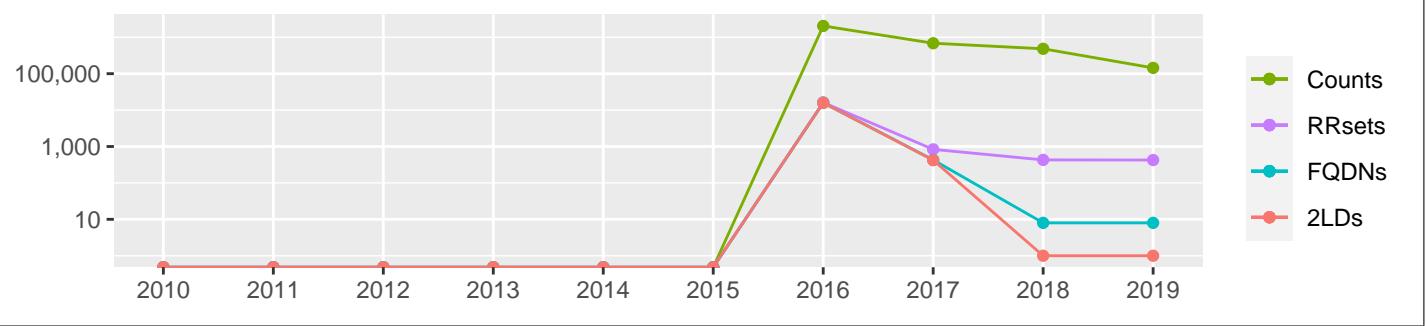
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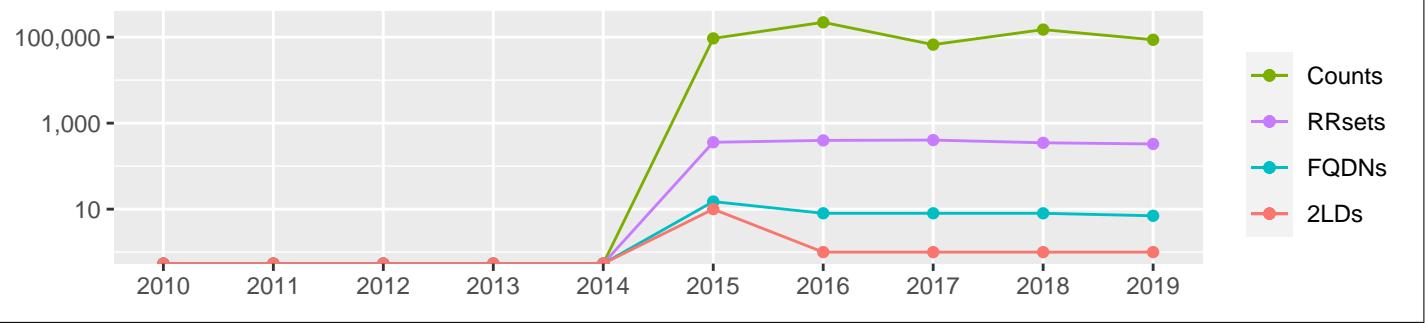
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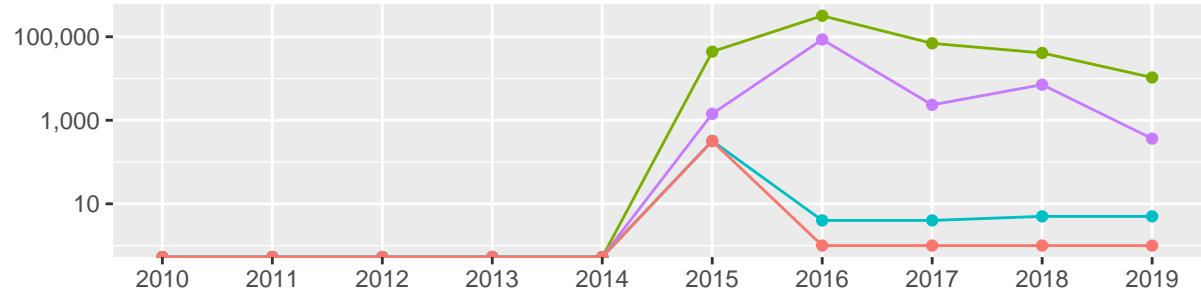
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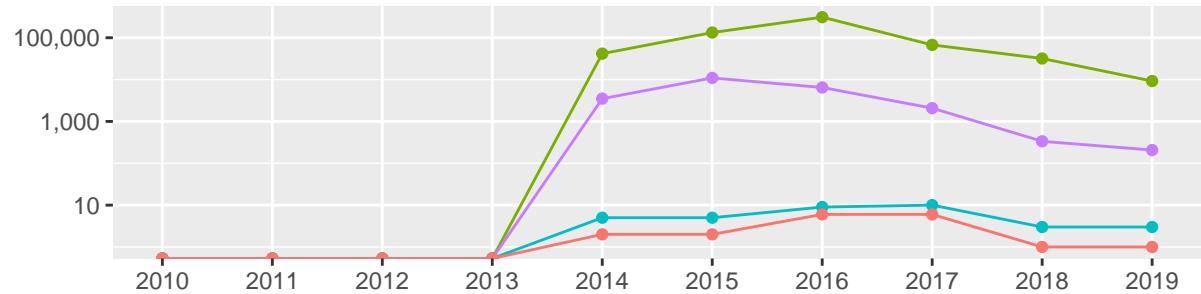
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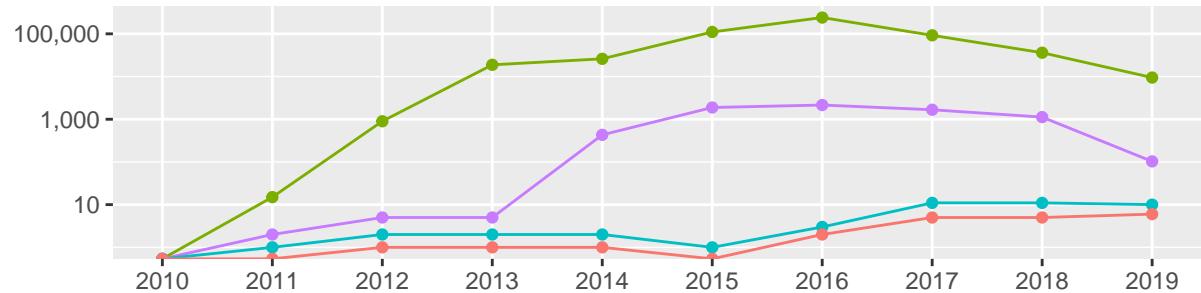
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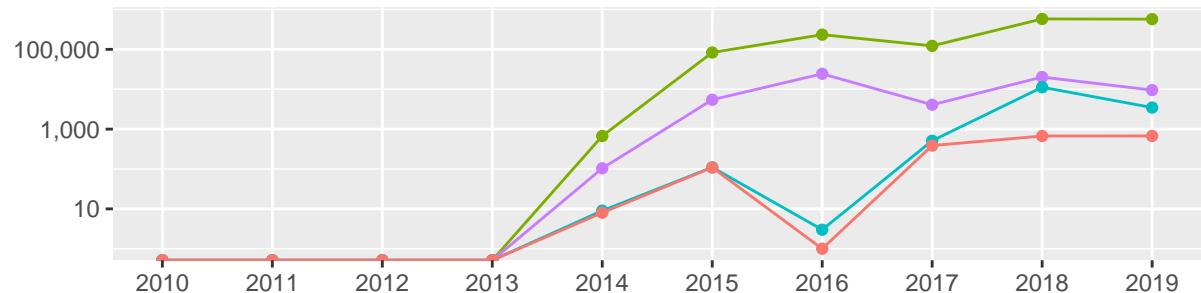
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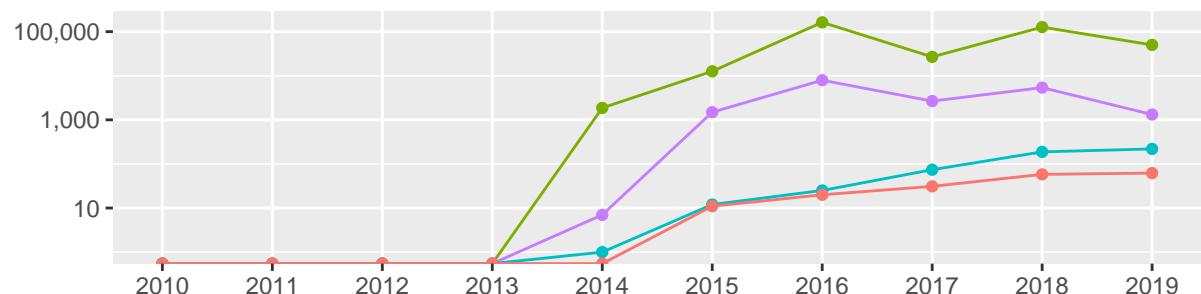
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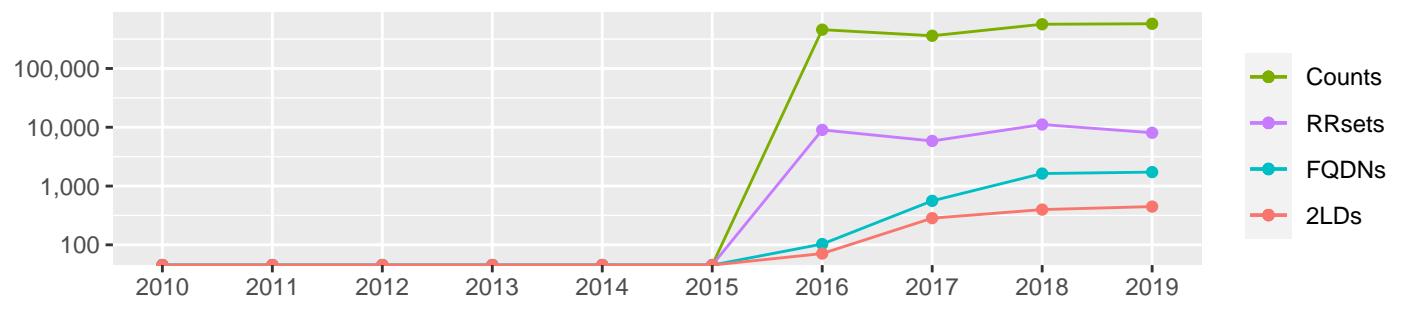
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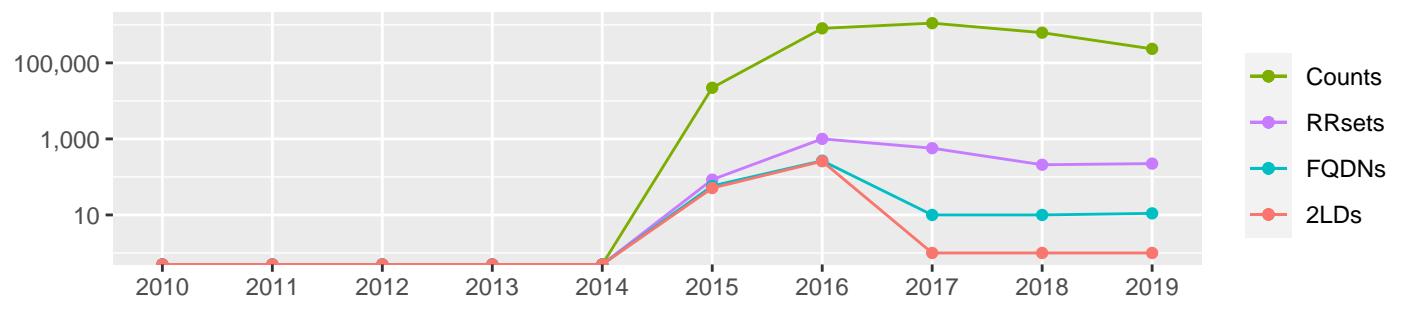
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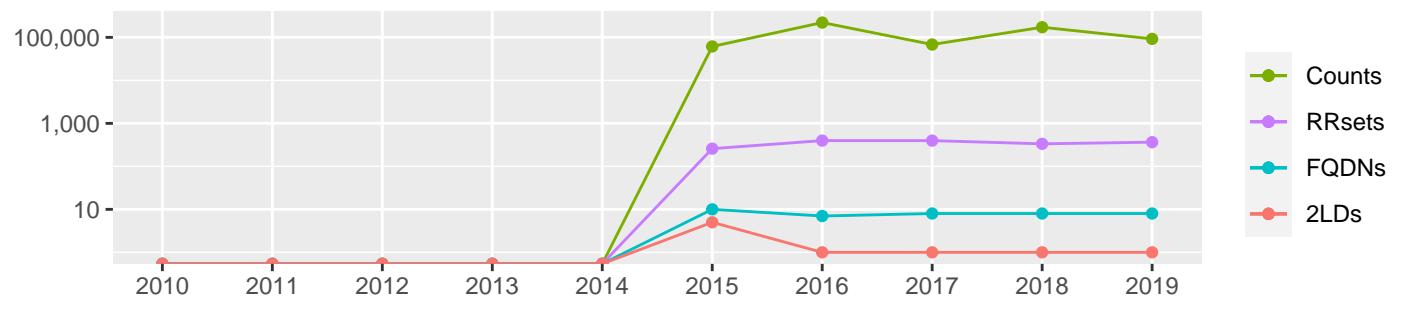
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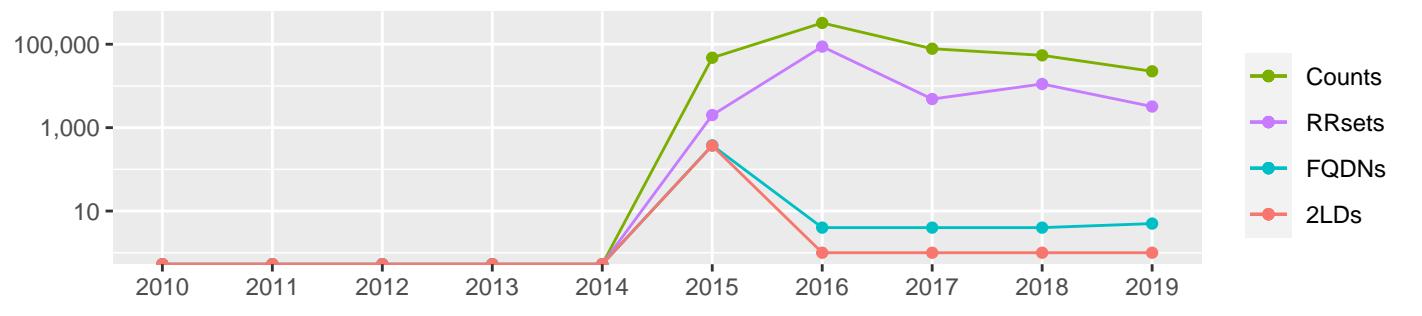
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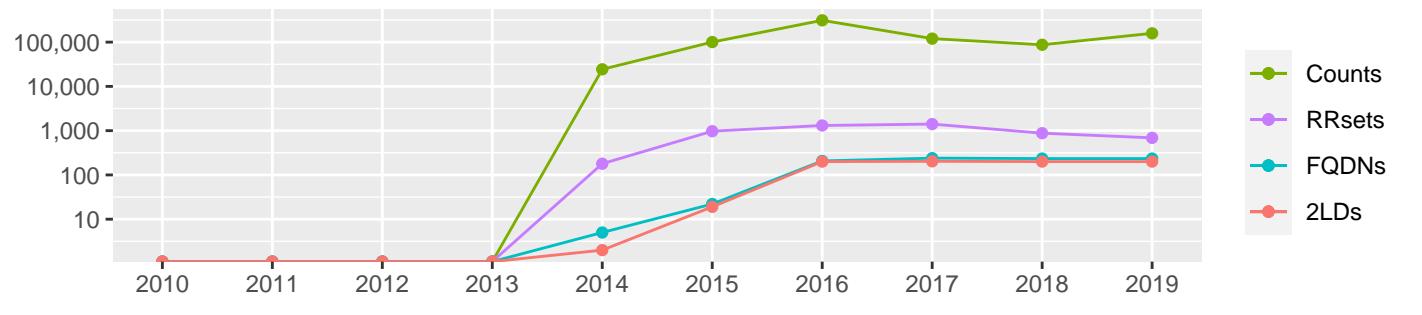
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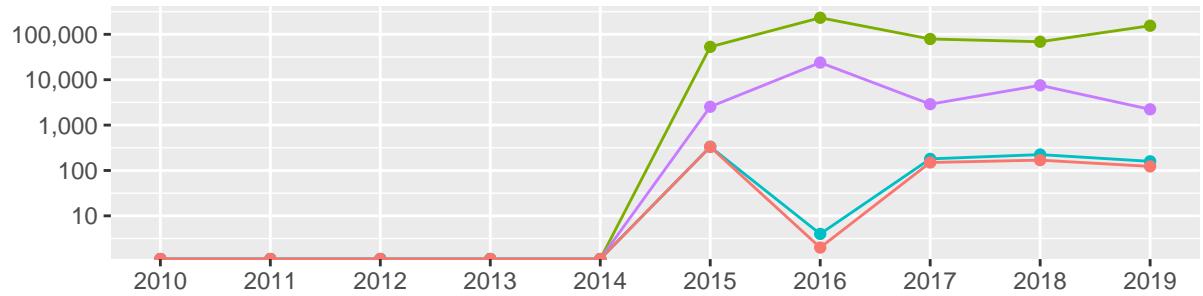
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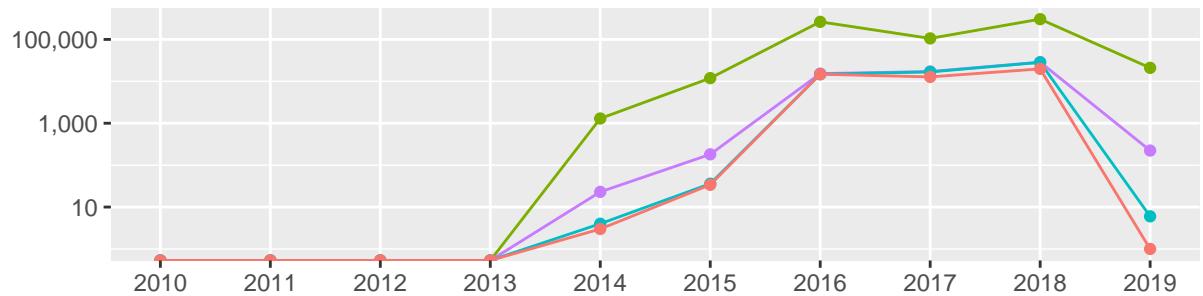
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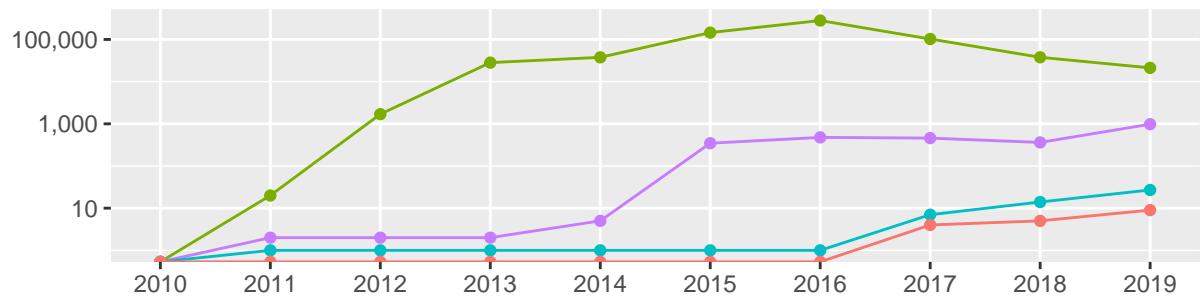
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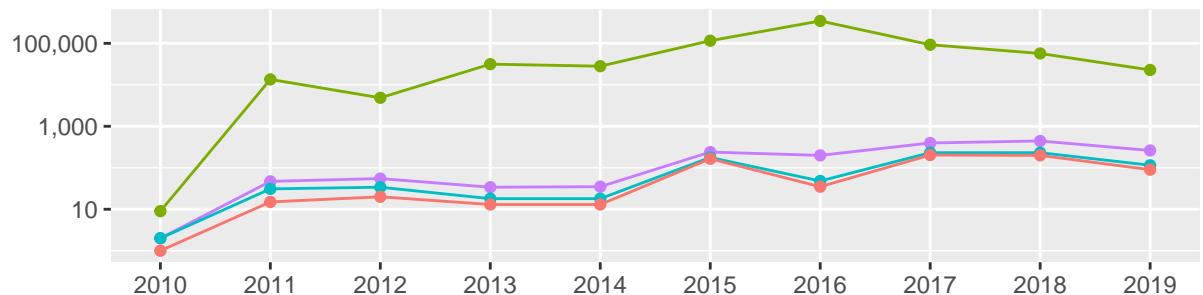
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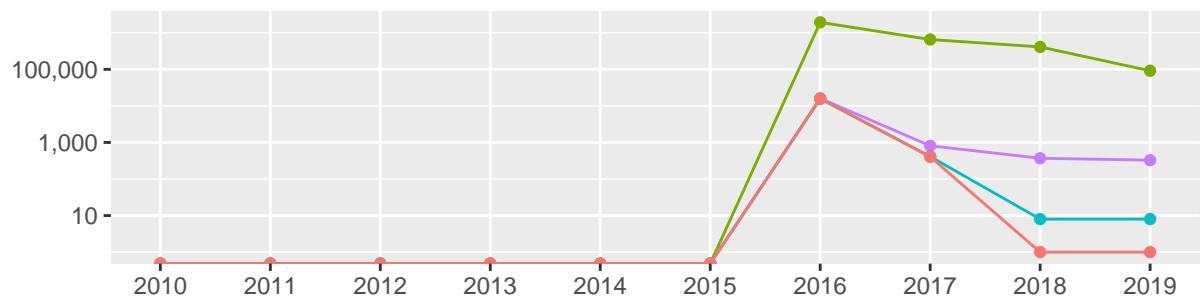
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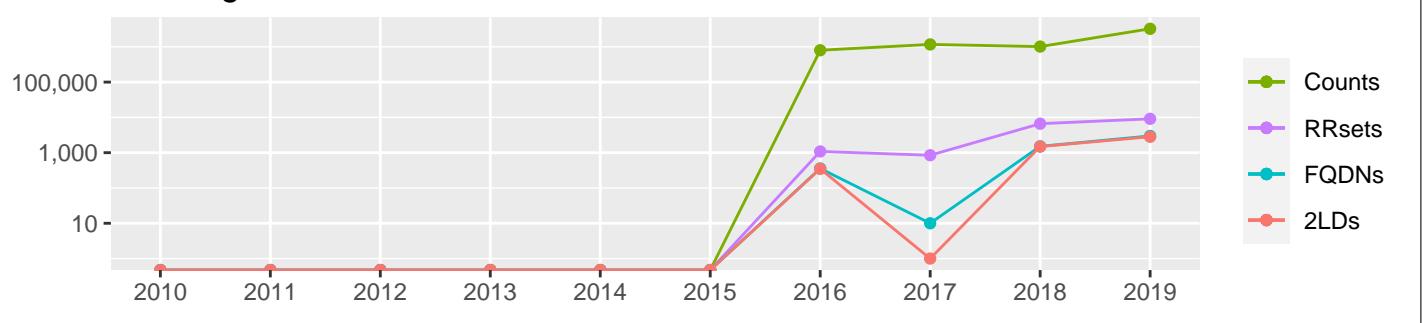
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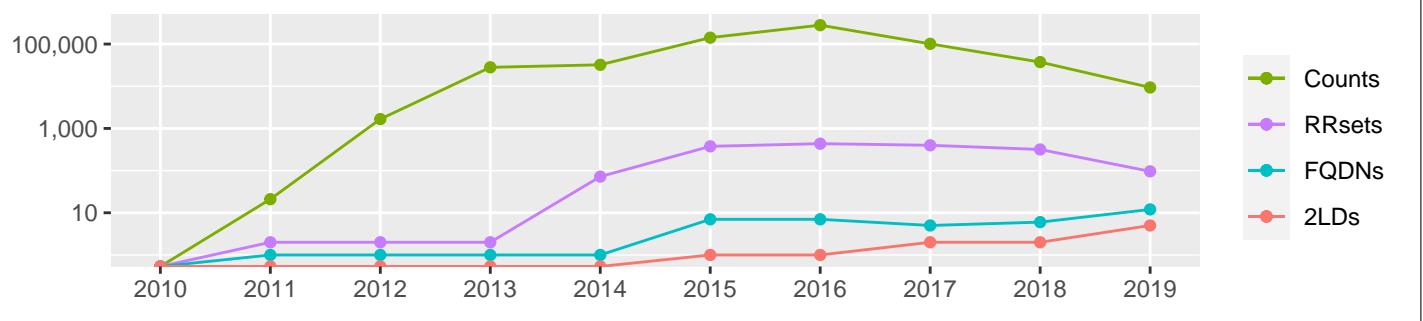
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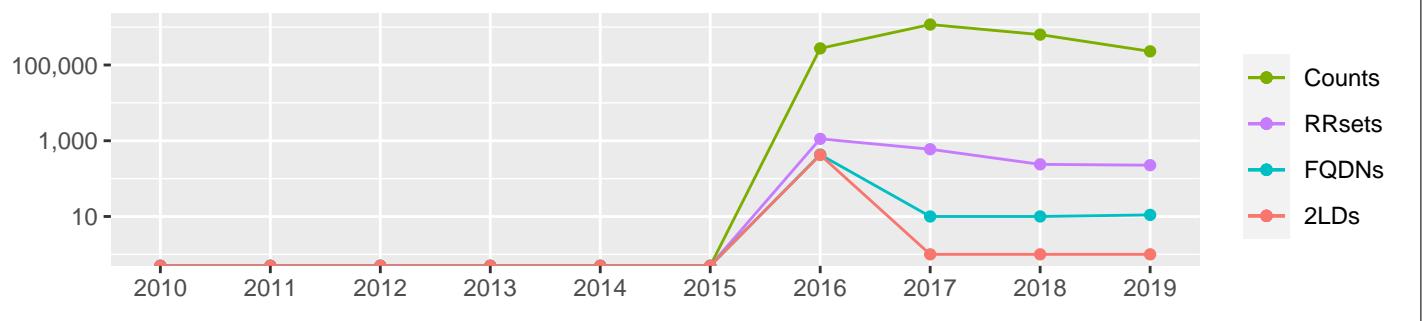
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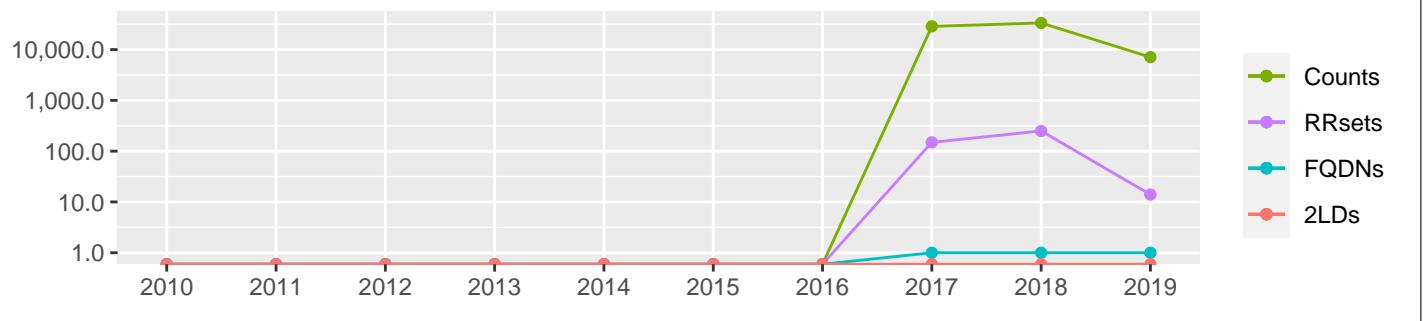
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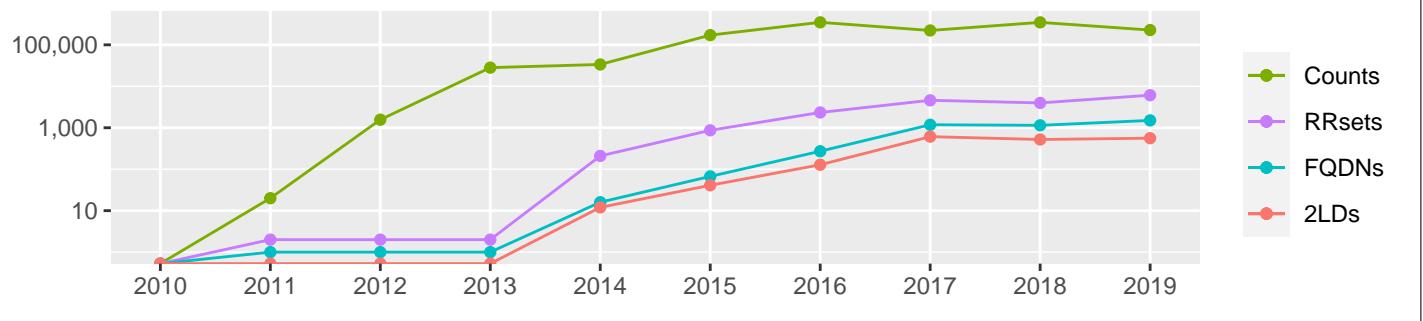
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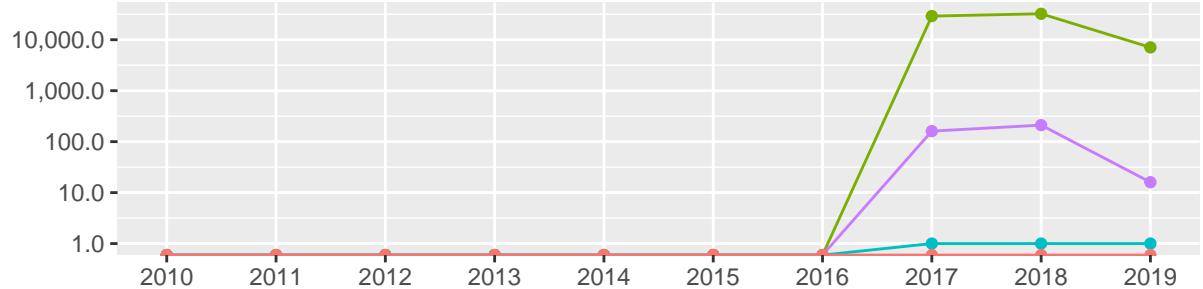
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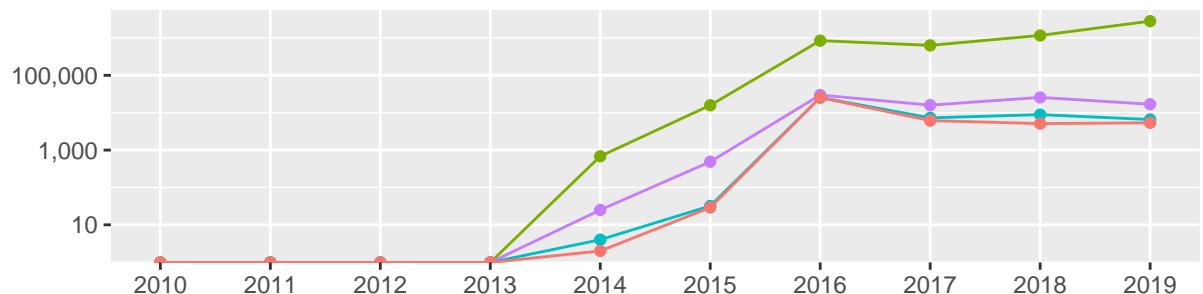
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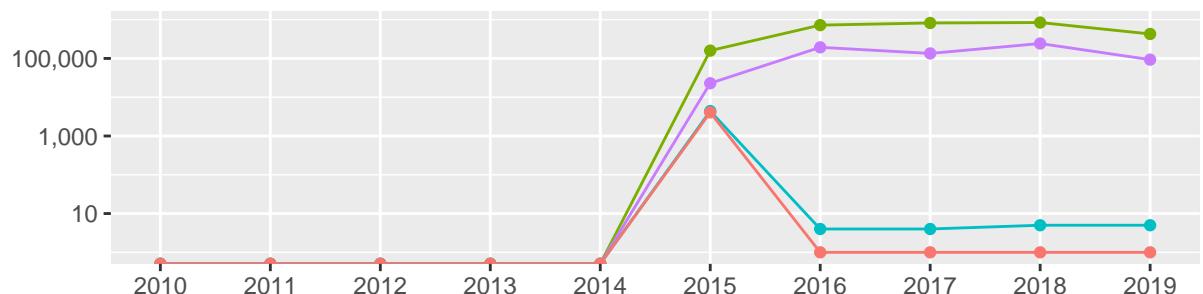
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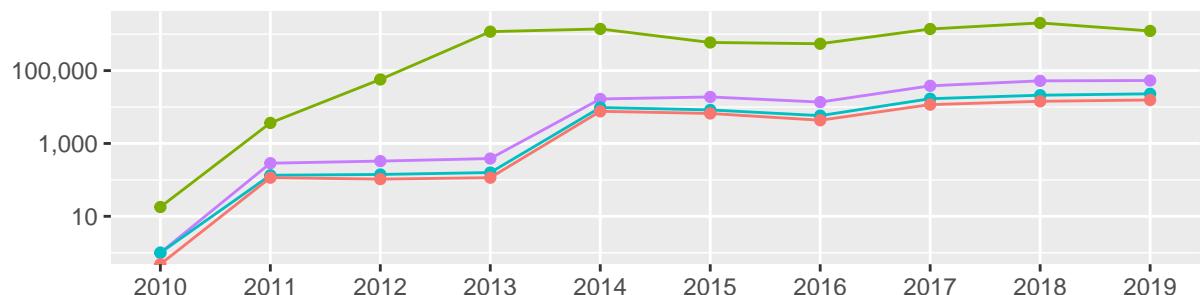
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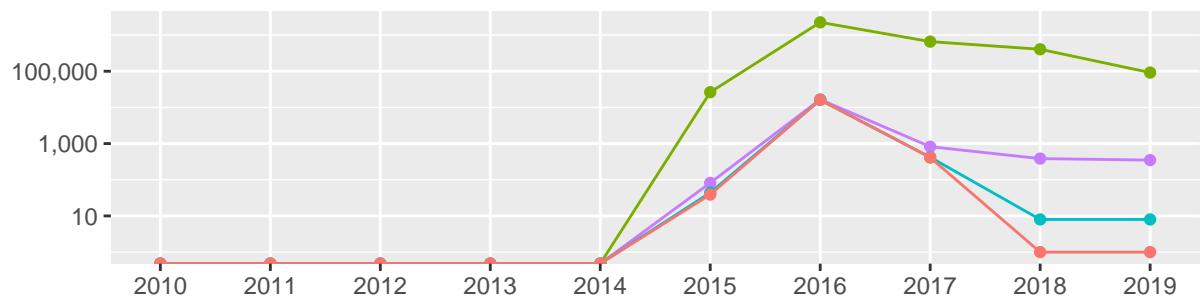
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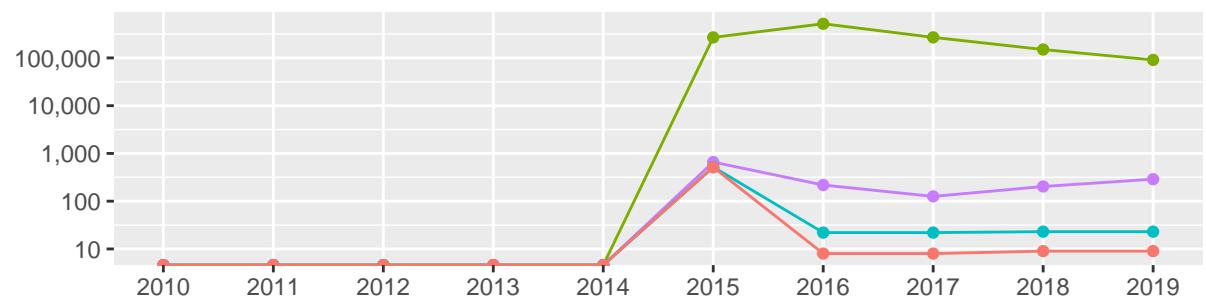
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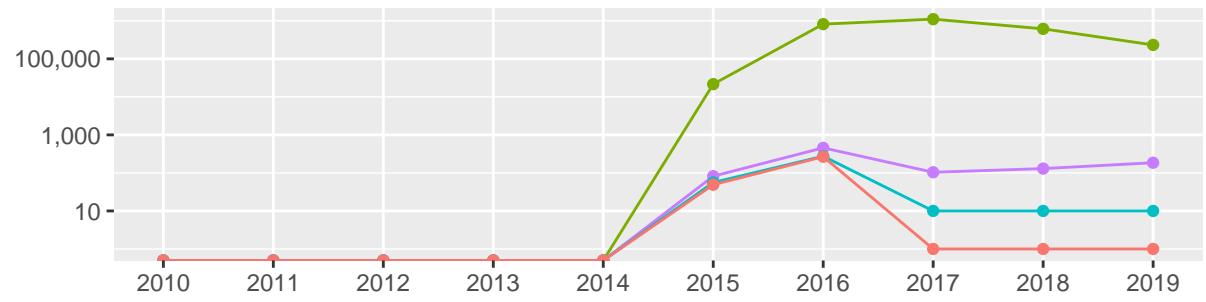
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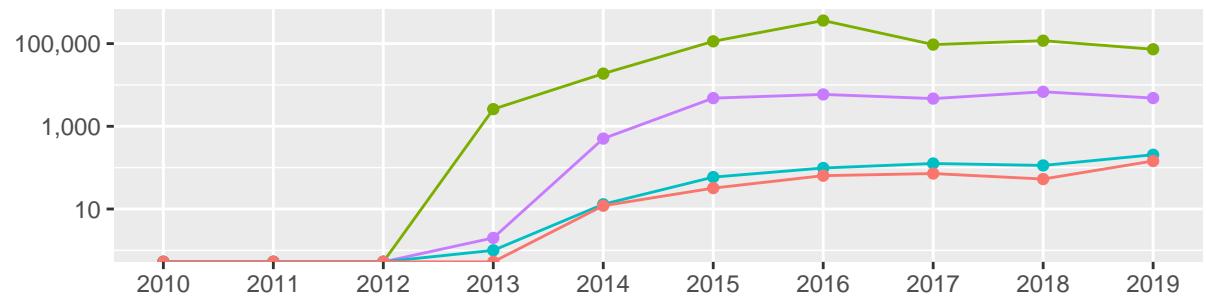
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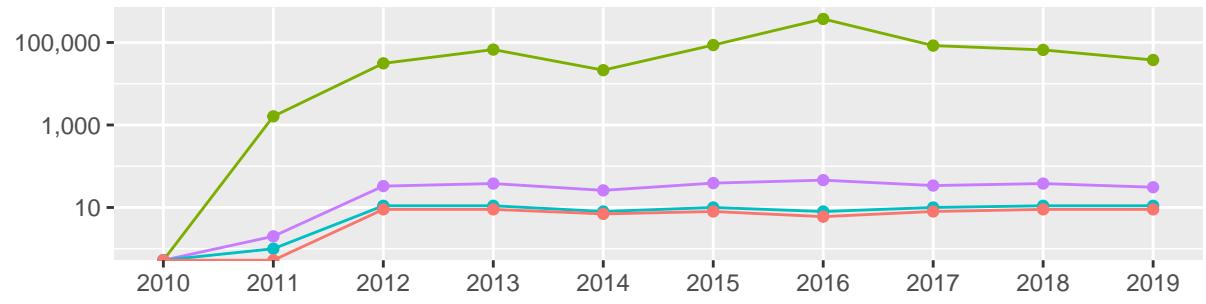
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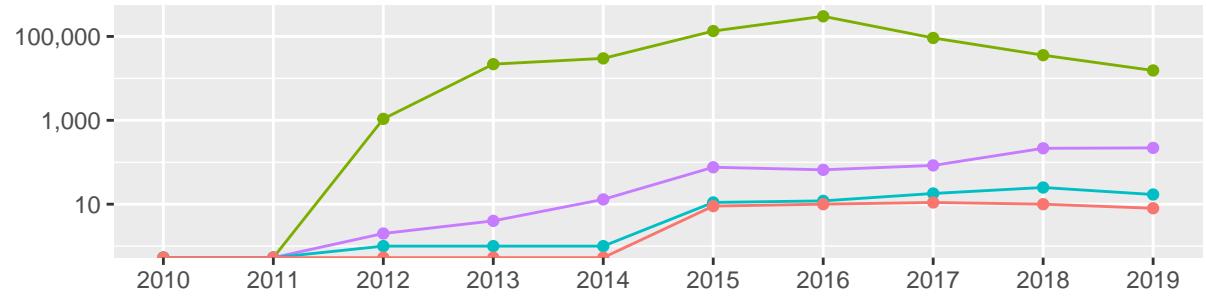
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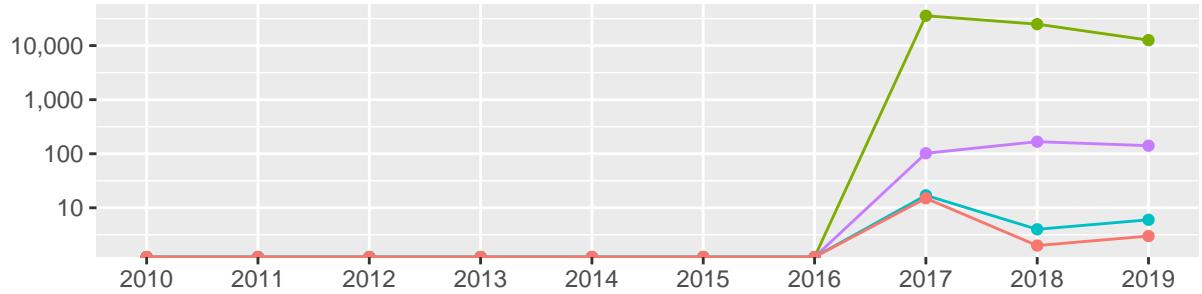
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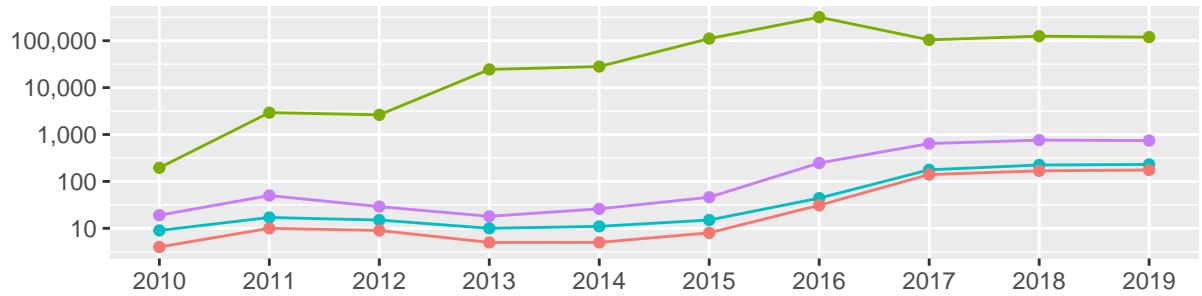
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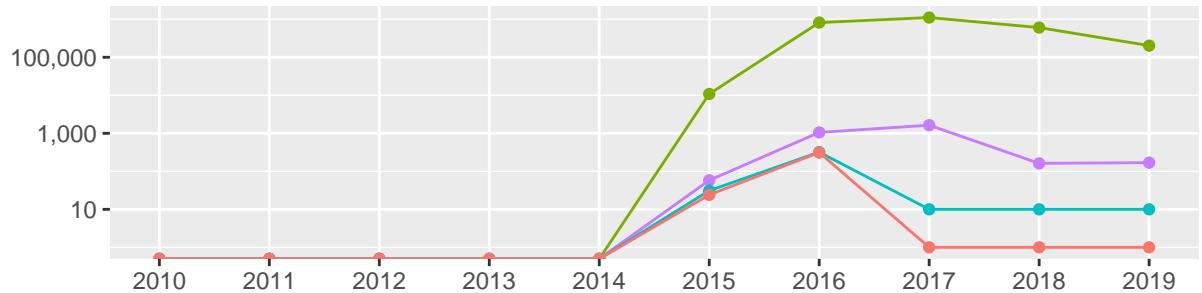
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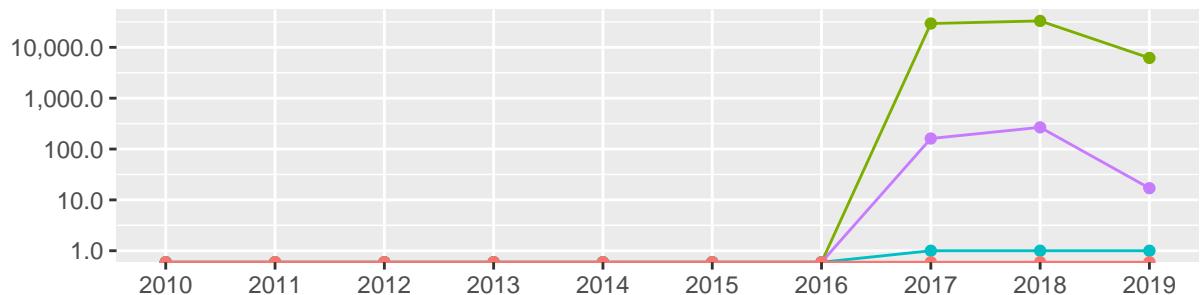
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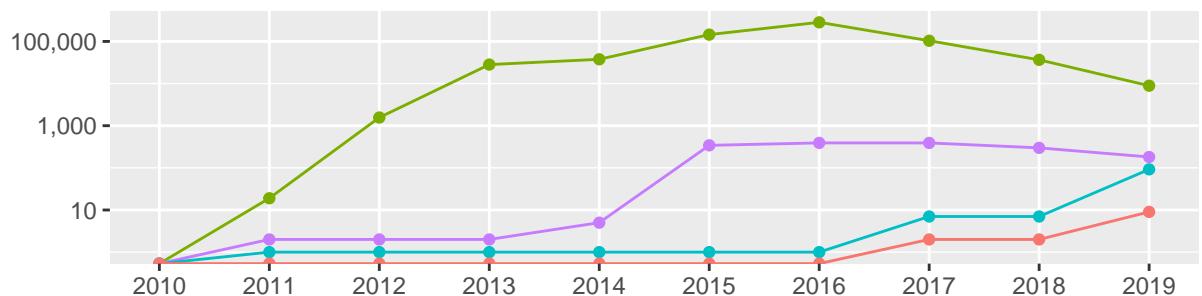
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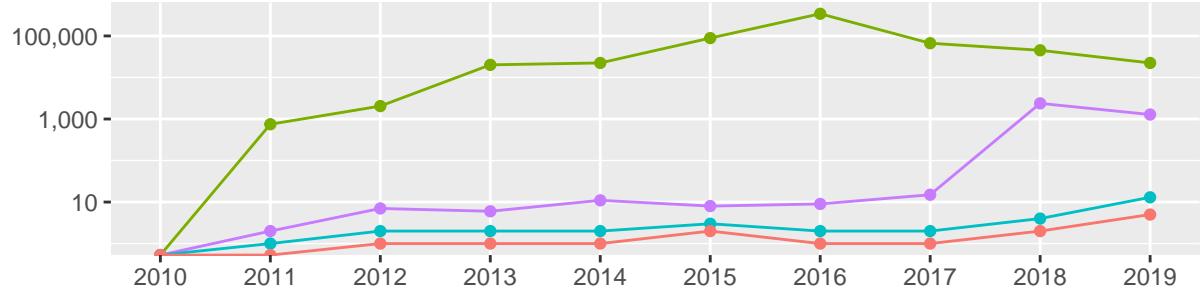
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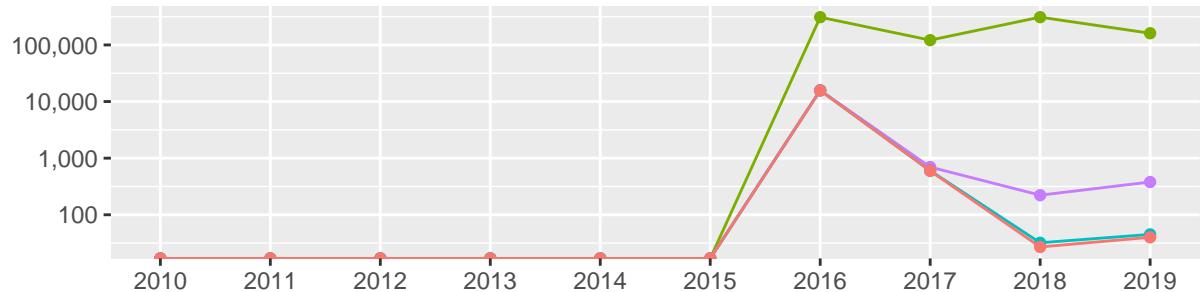
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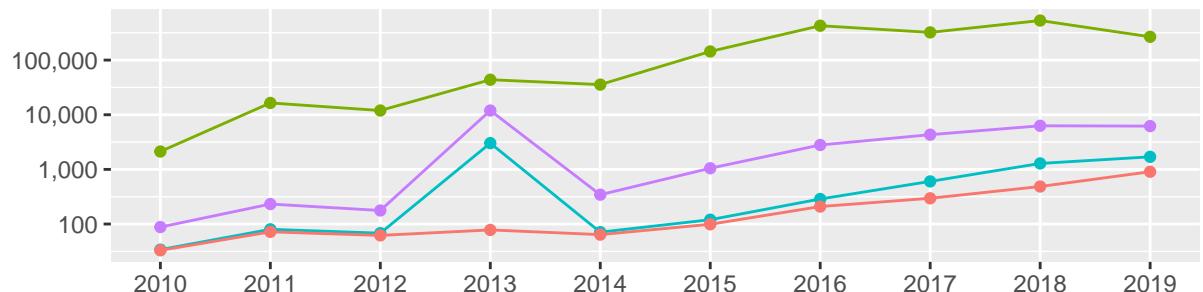
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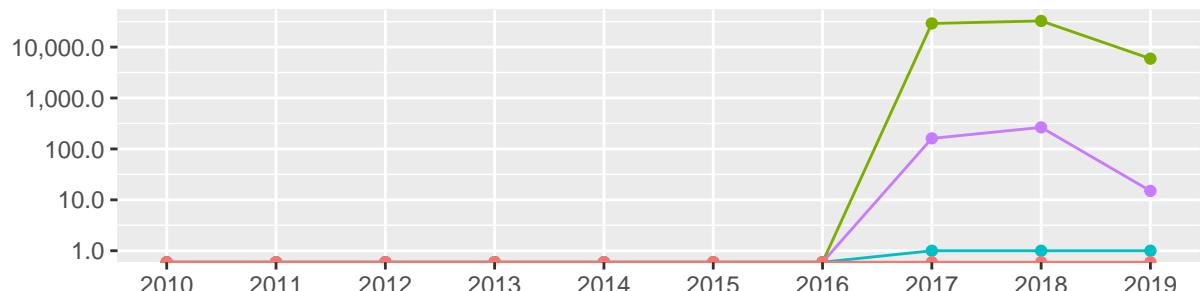
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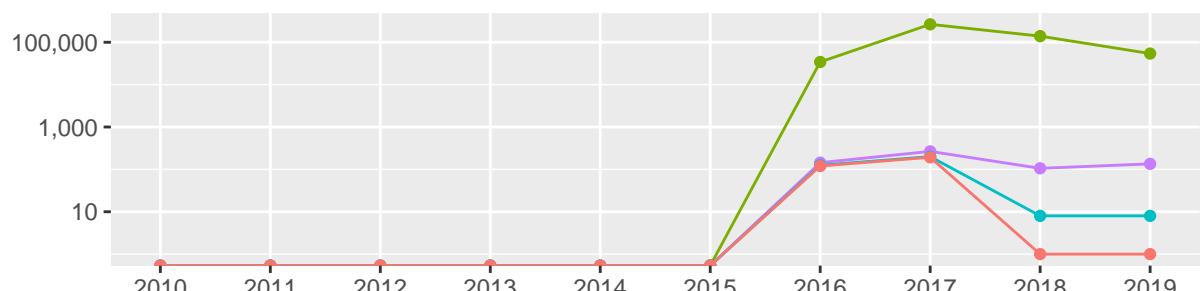
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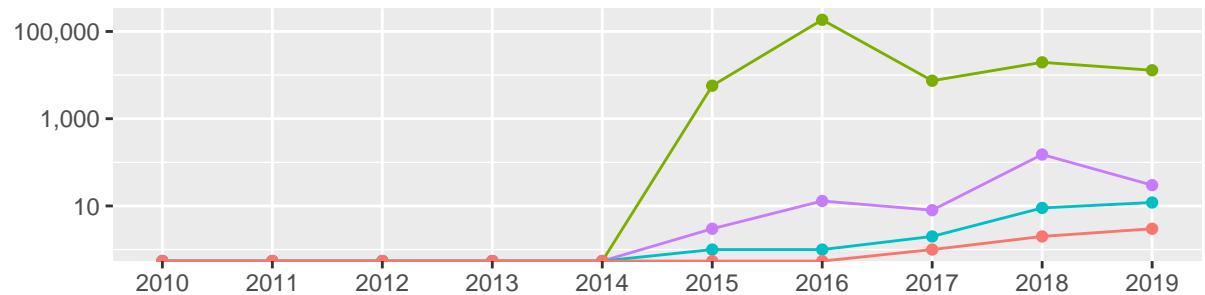
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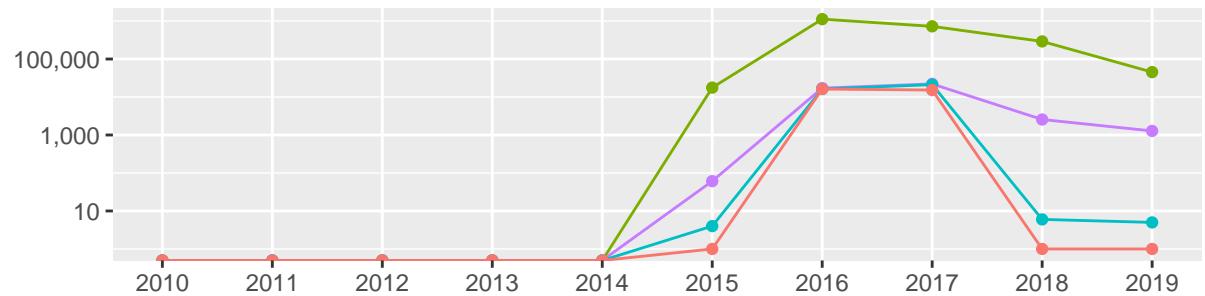
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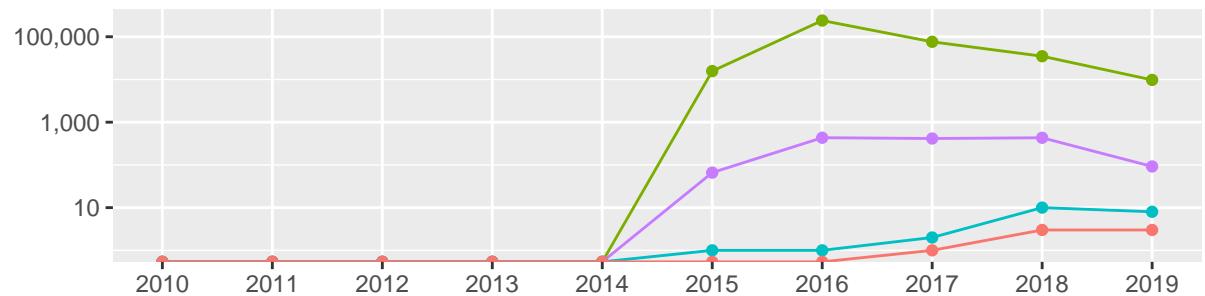
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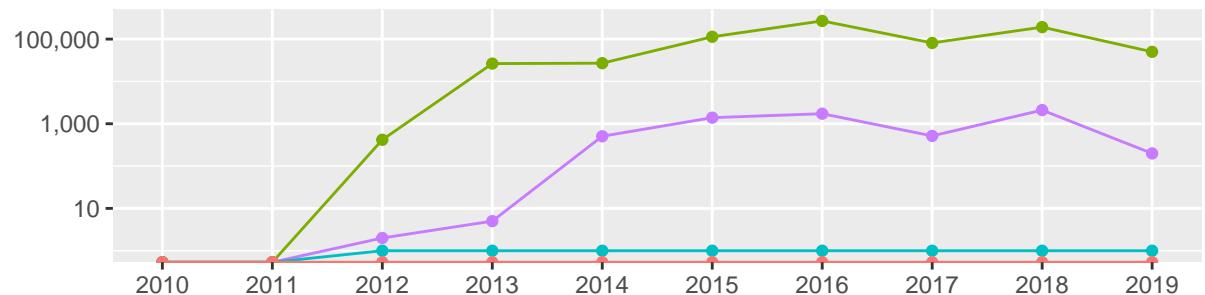
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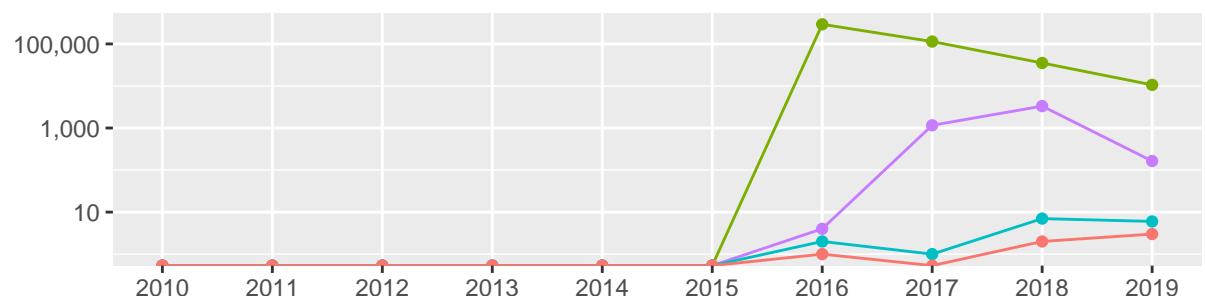
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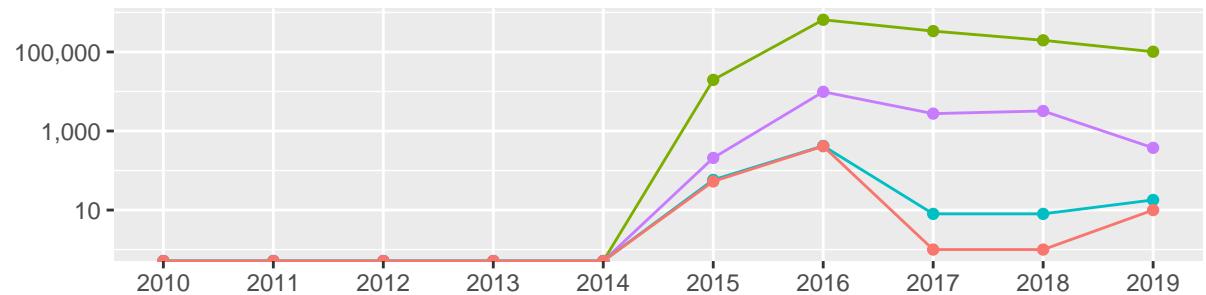
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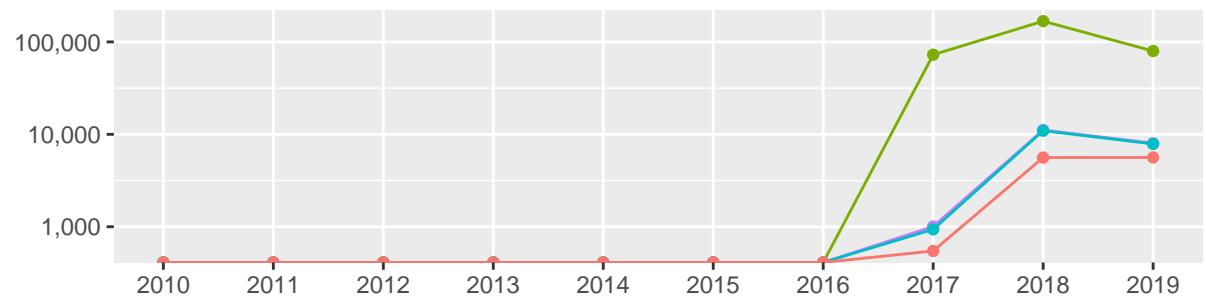
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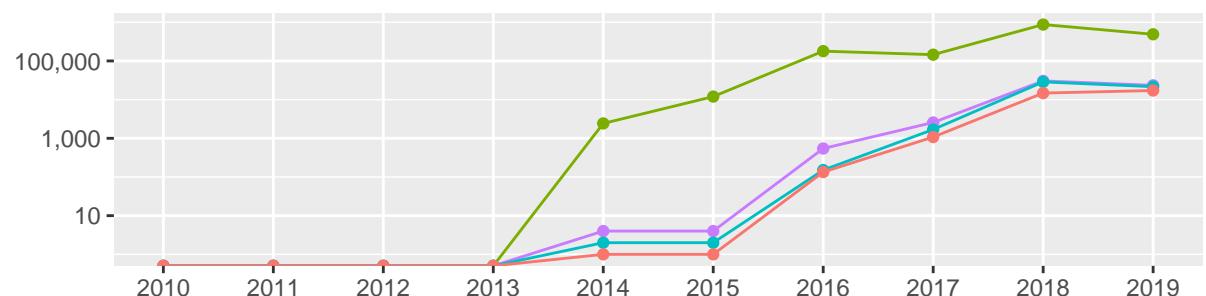
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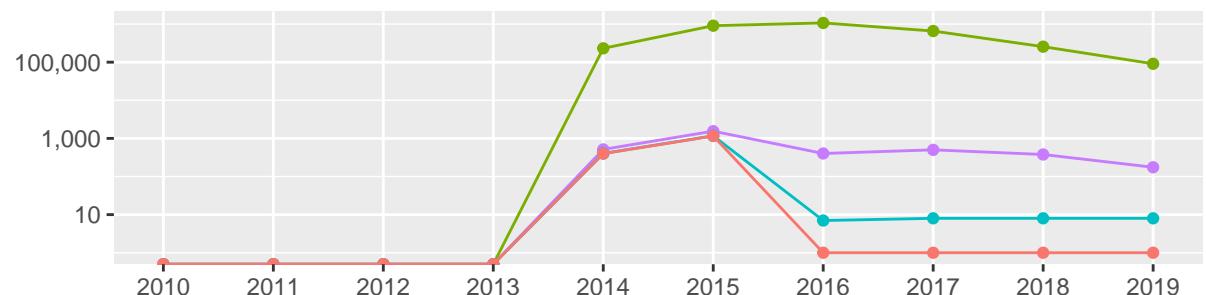
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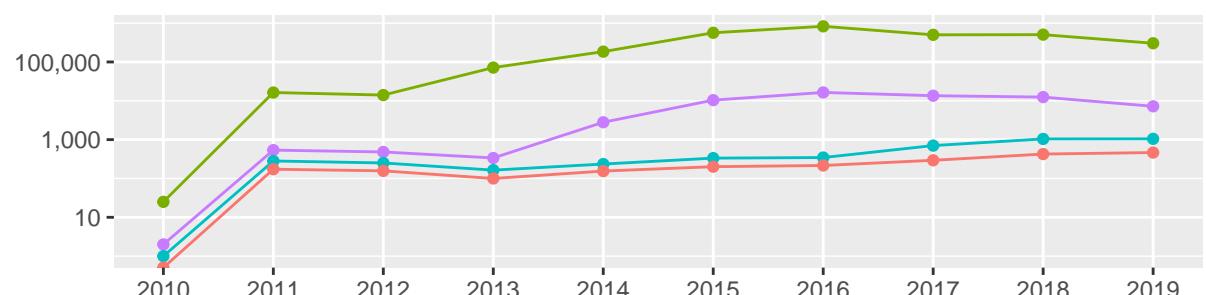
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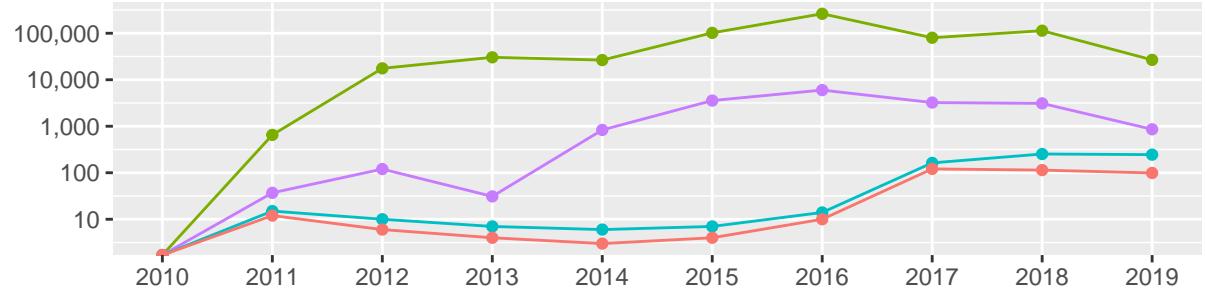
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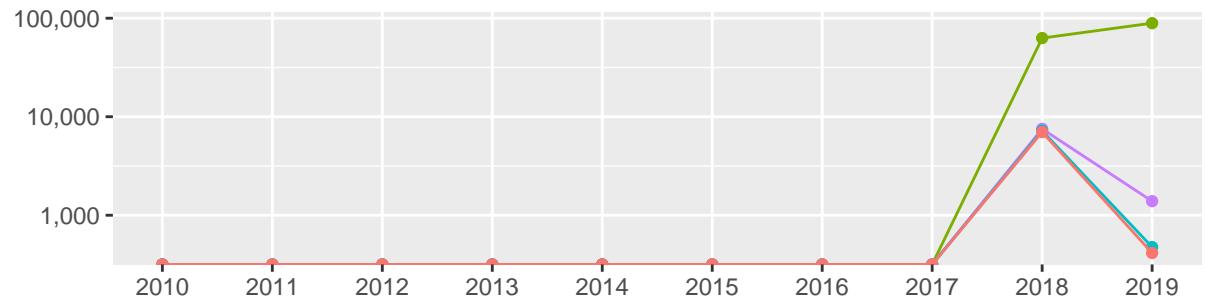
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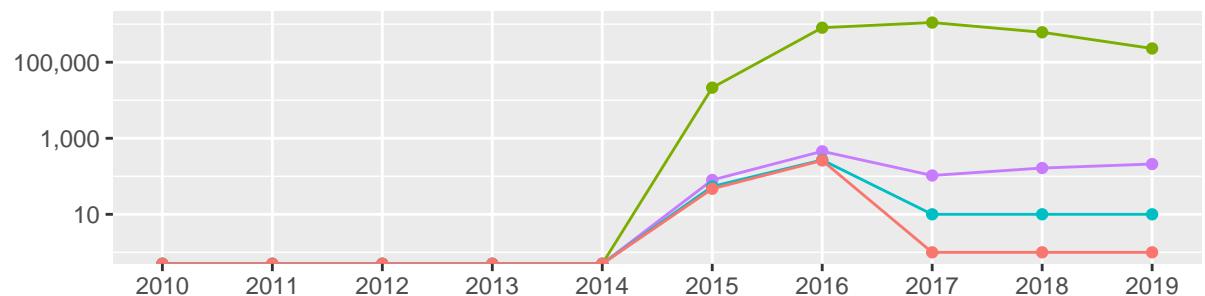
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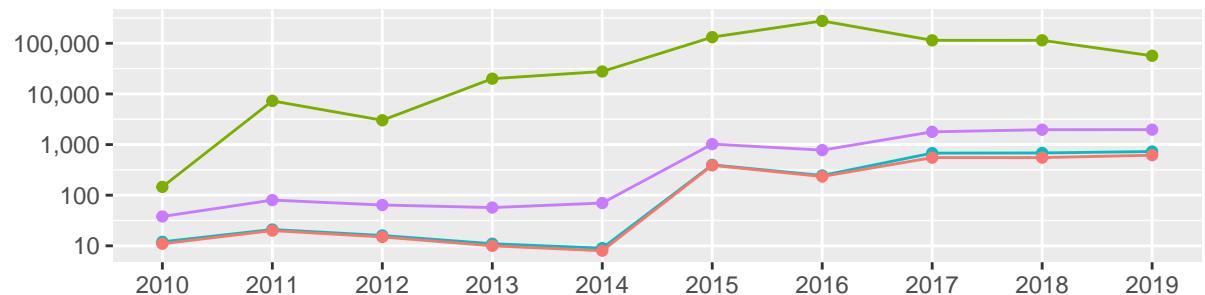
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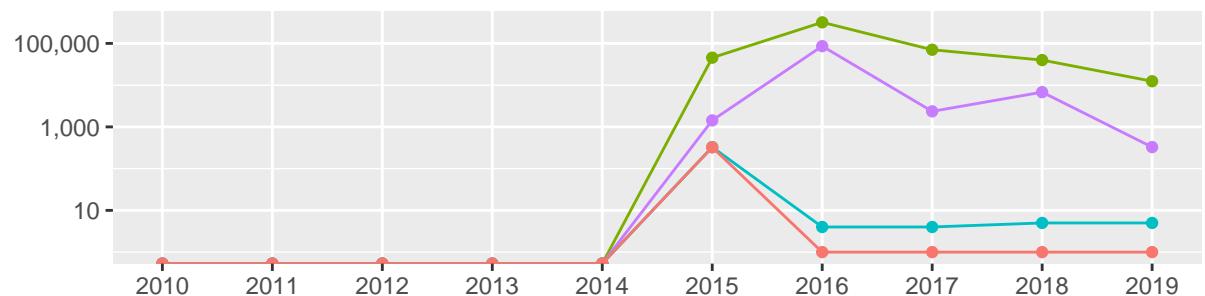
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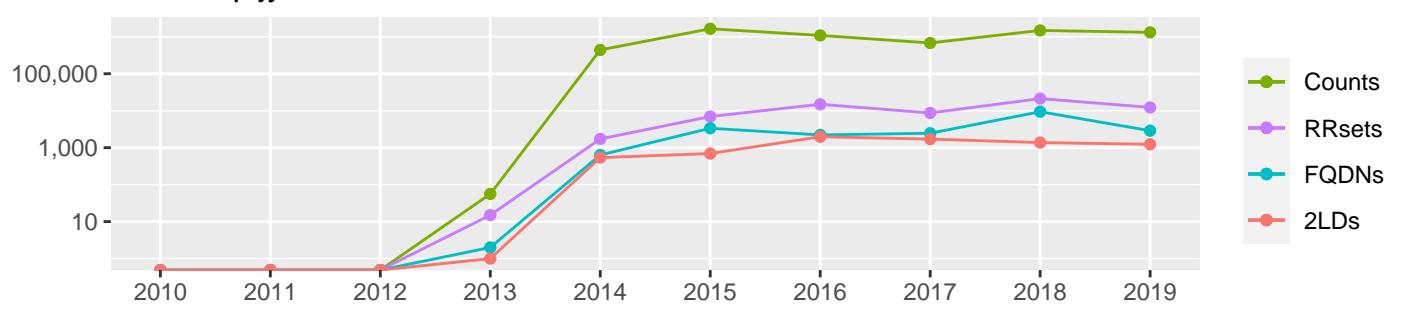
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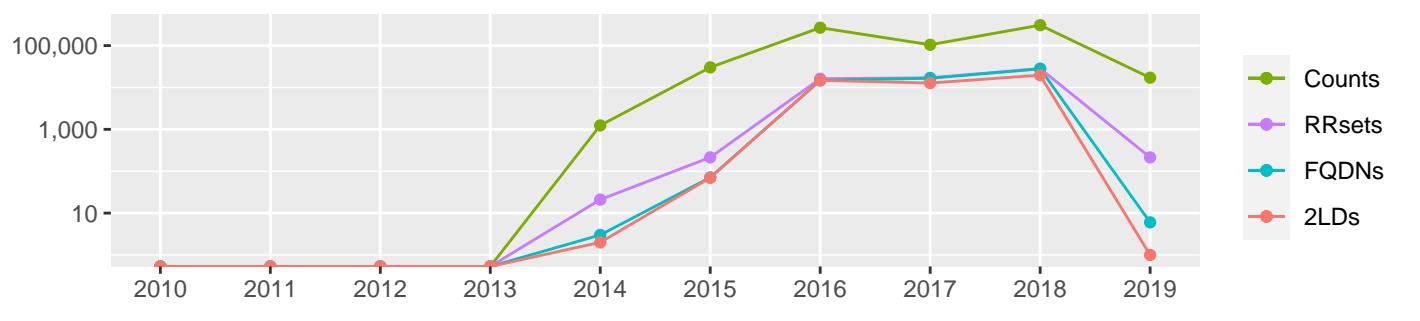
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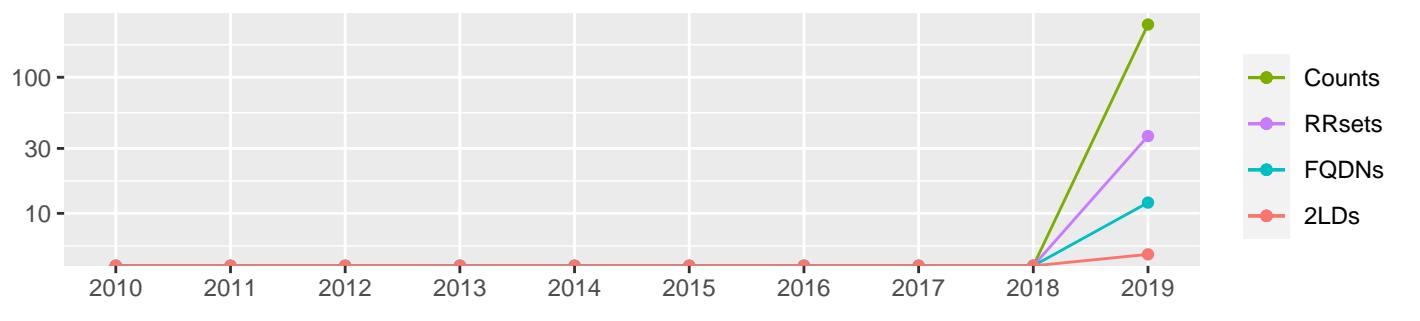
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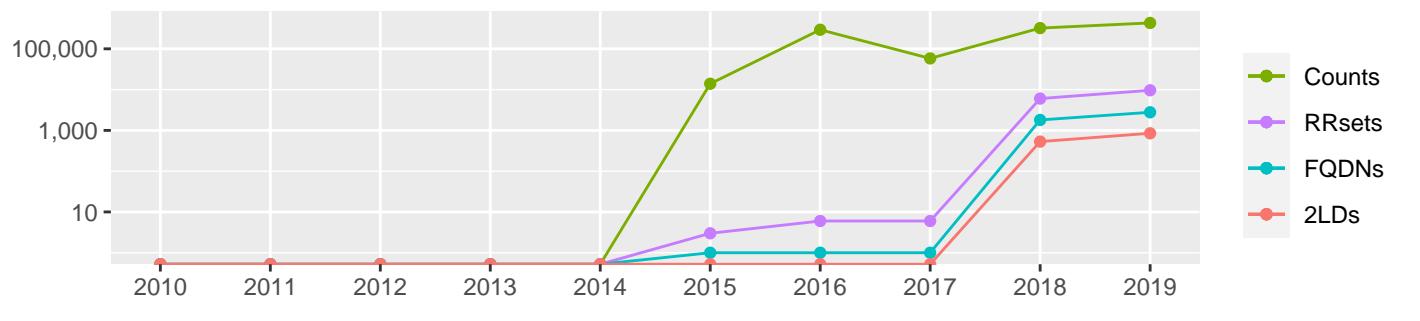
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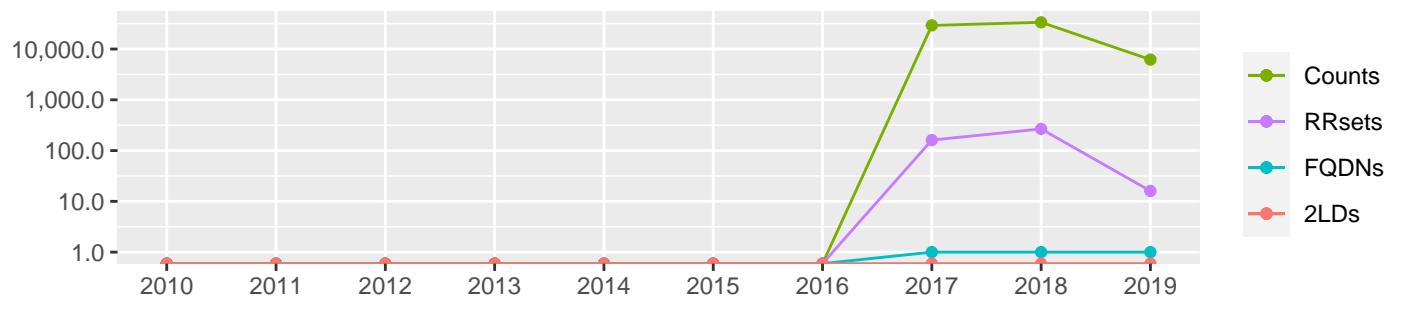
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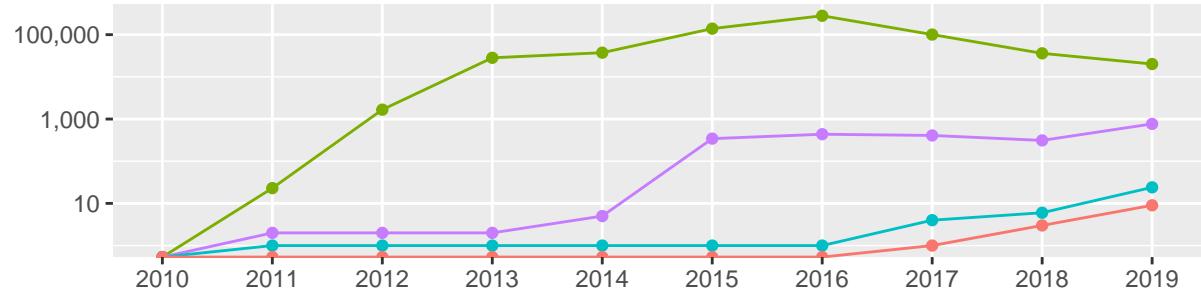
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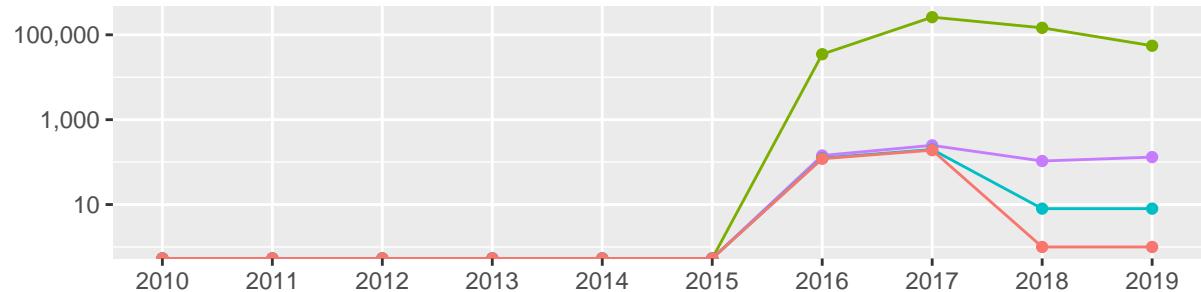
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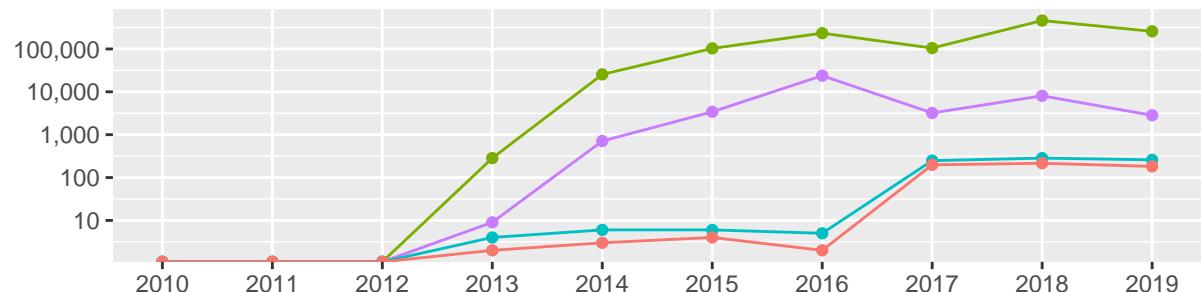
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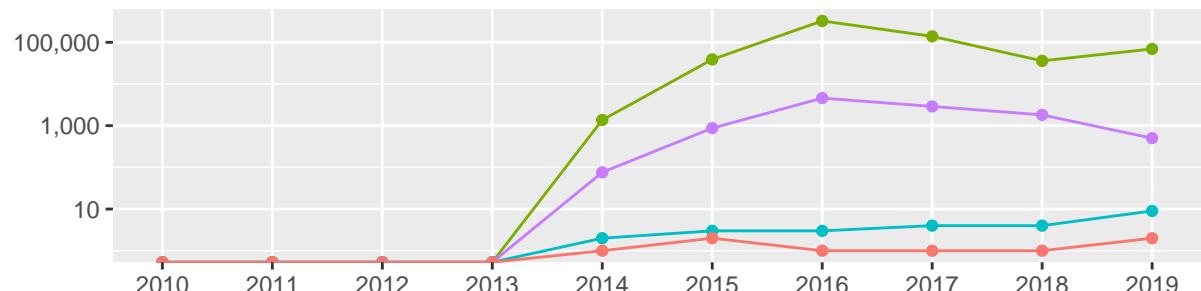
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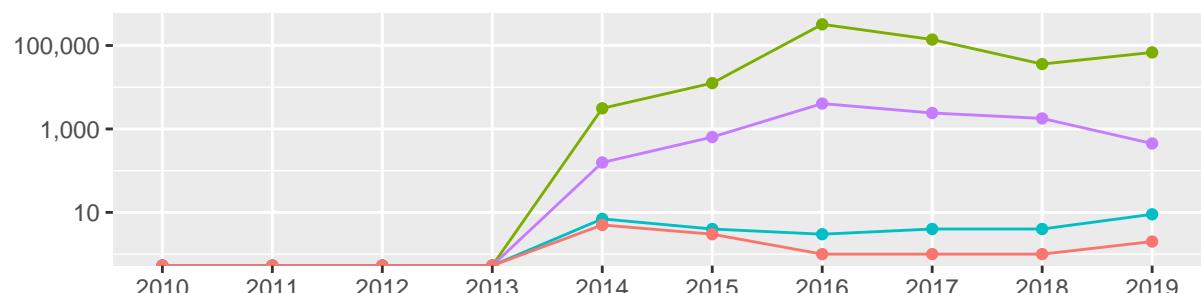
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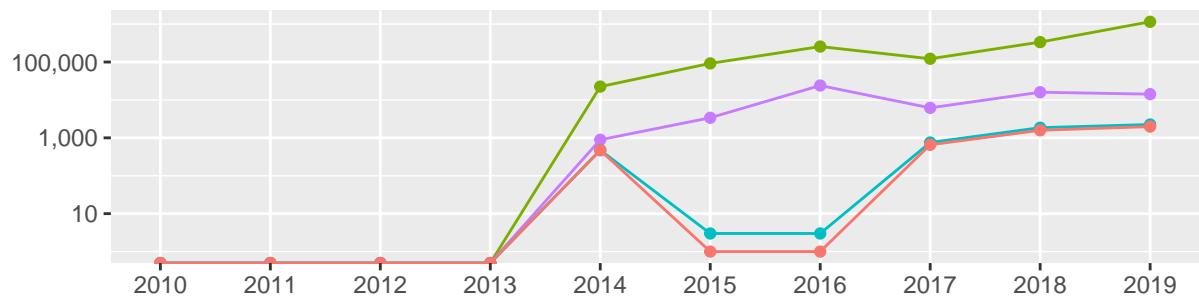
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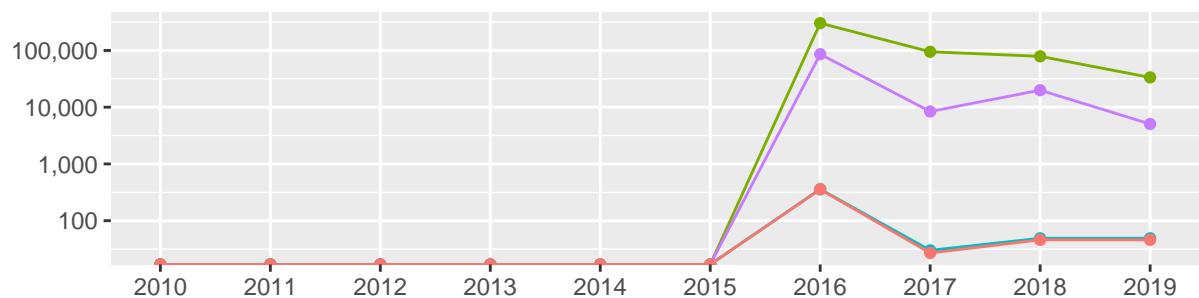
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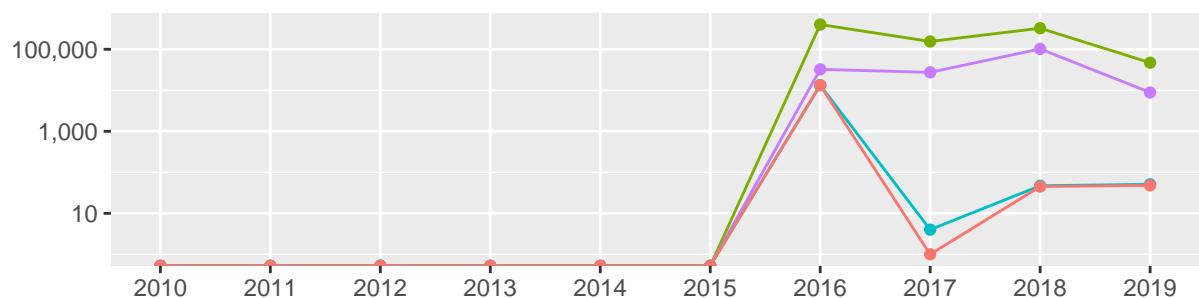
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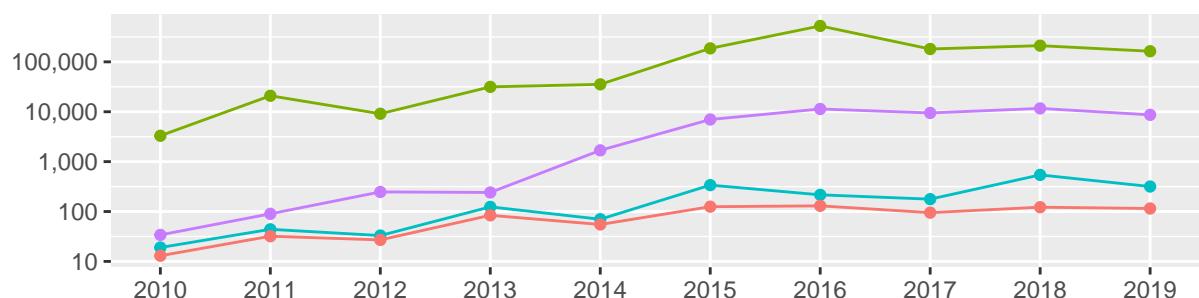
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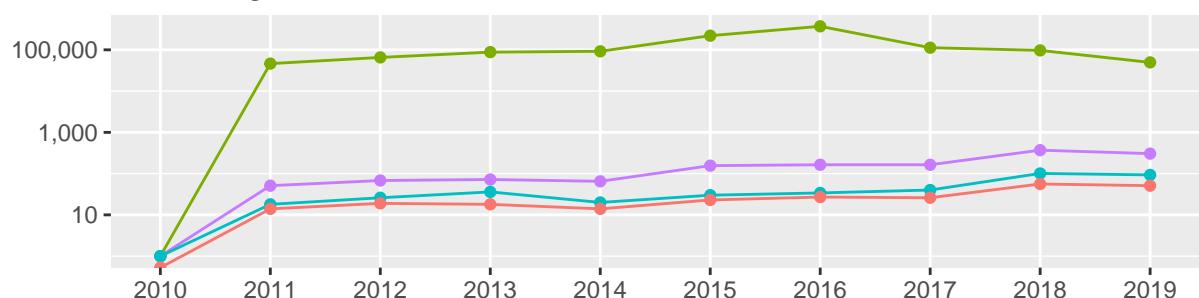
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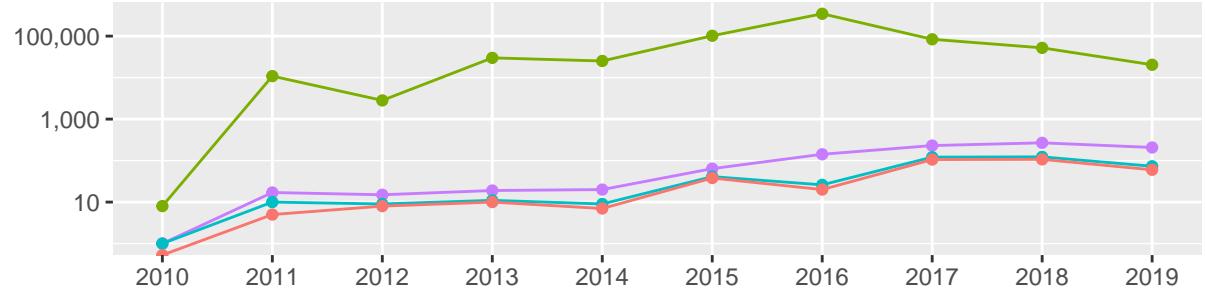
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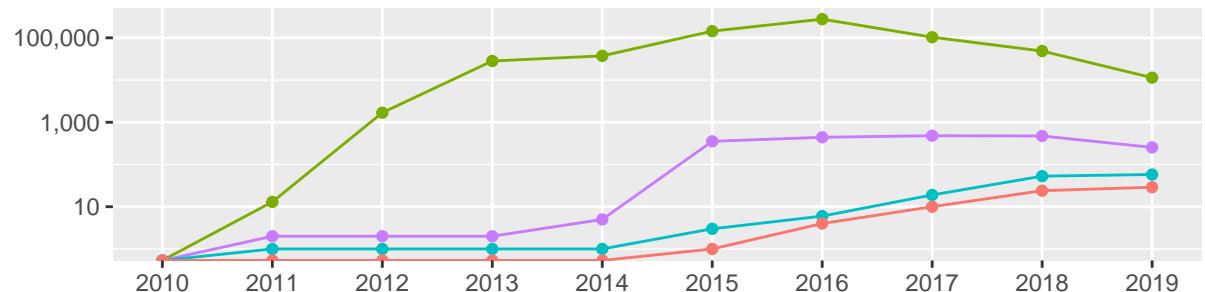
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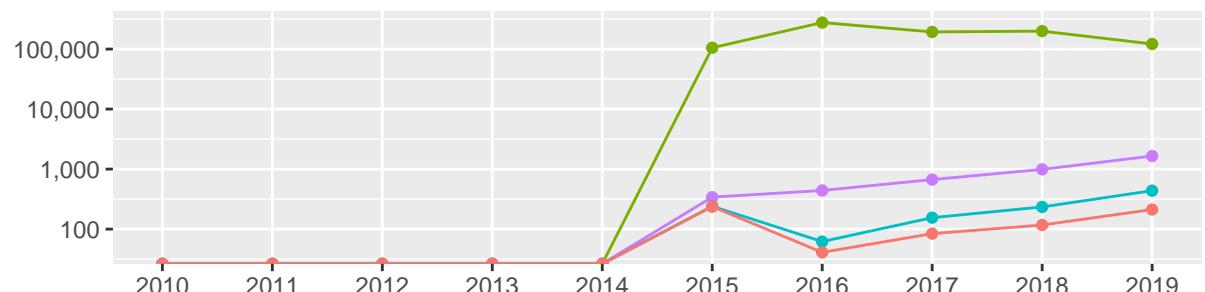
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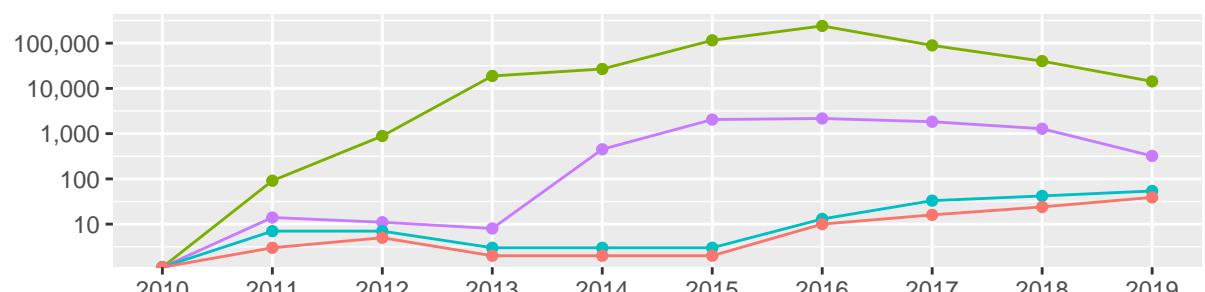
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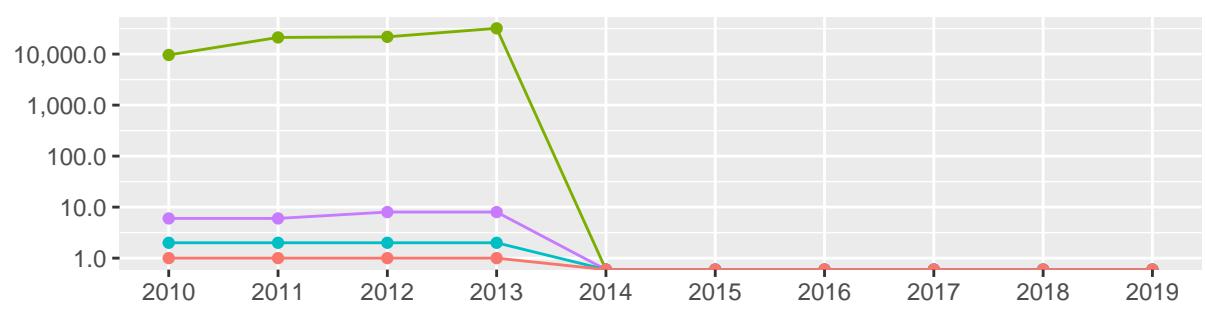
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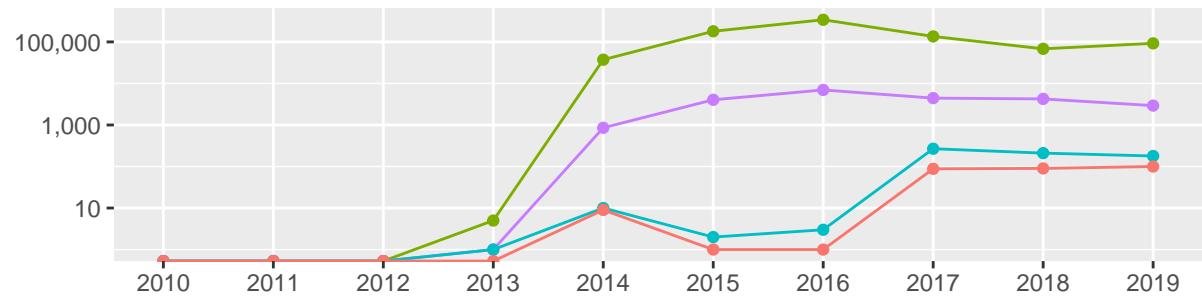
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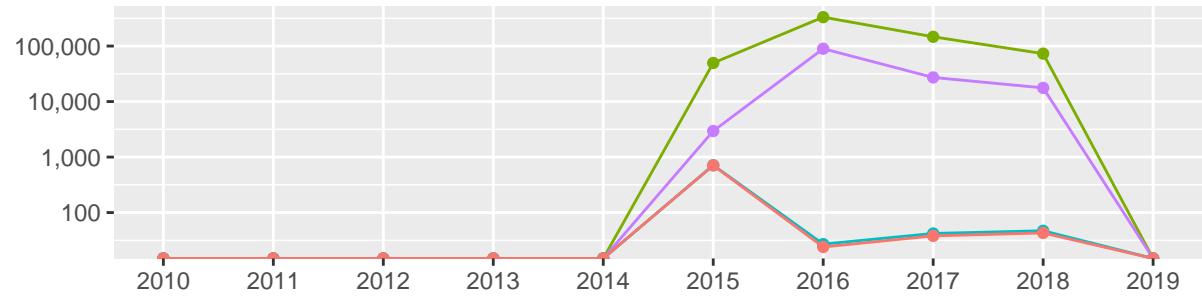
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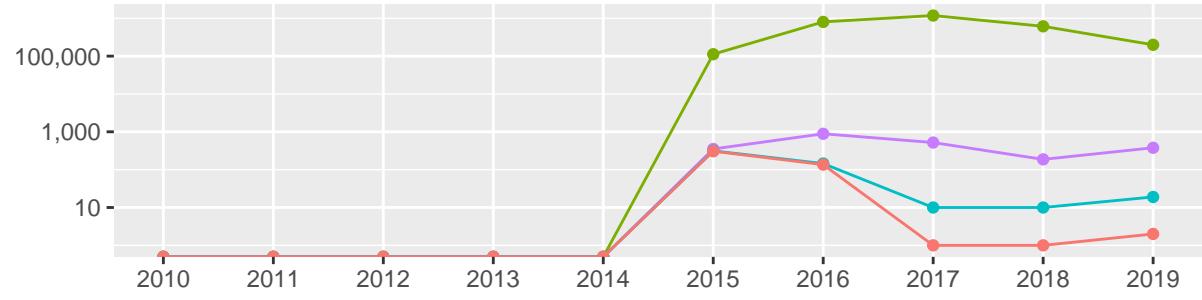
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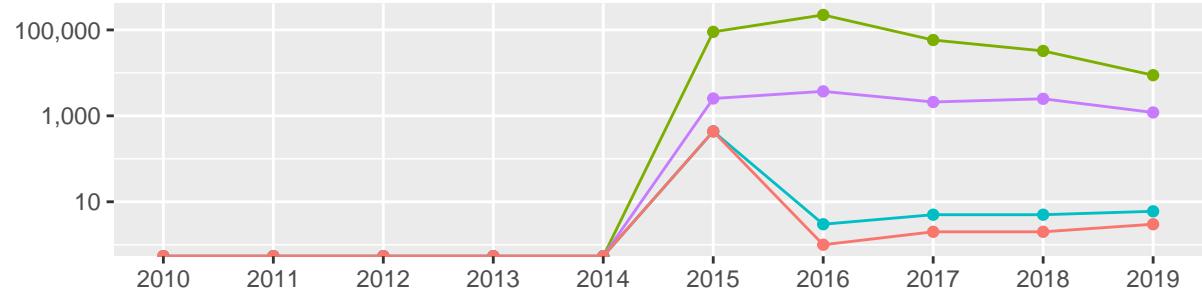
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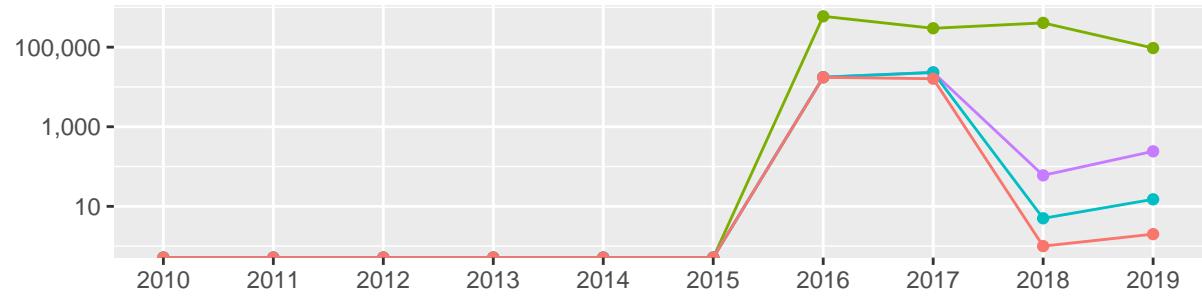
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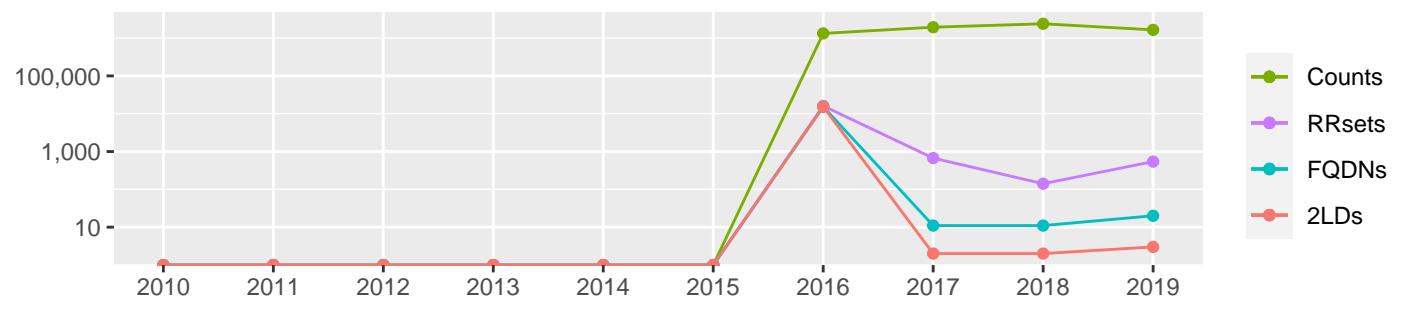
*. yodobashi



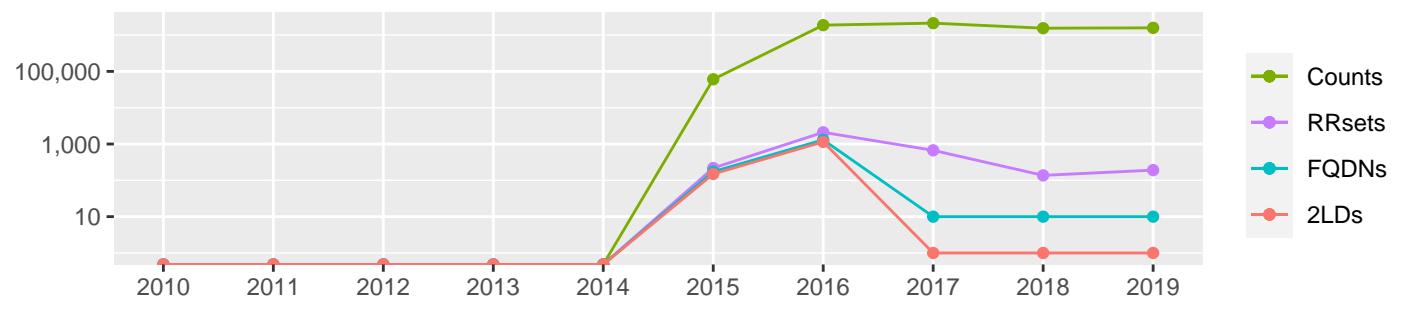
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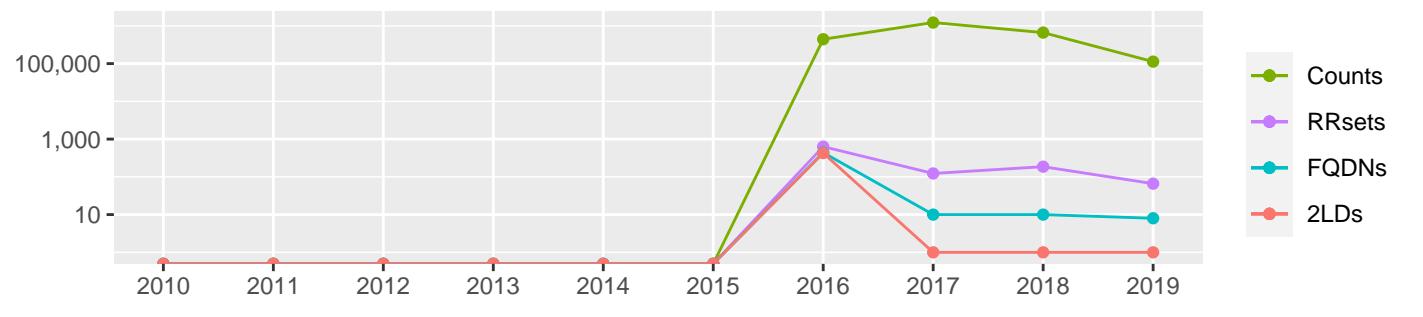
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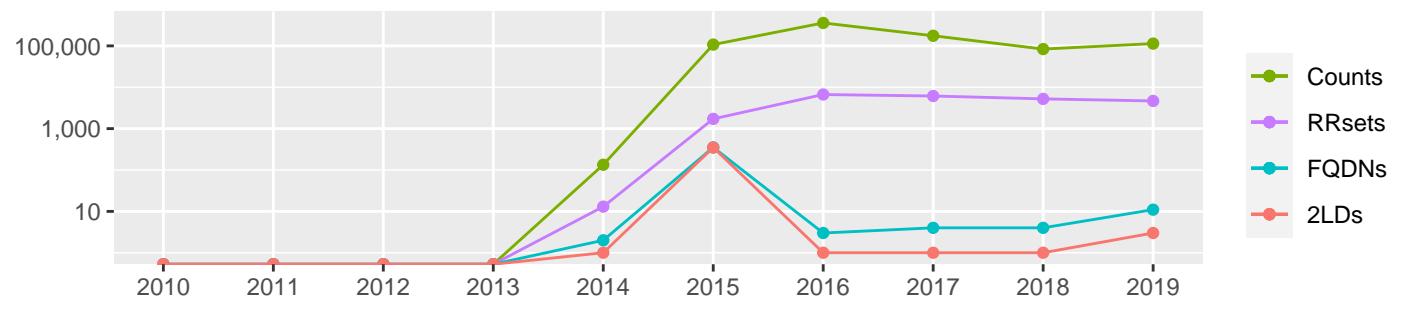
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*. zippo

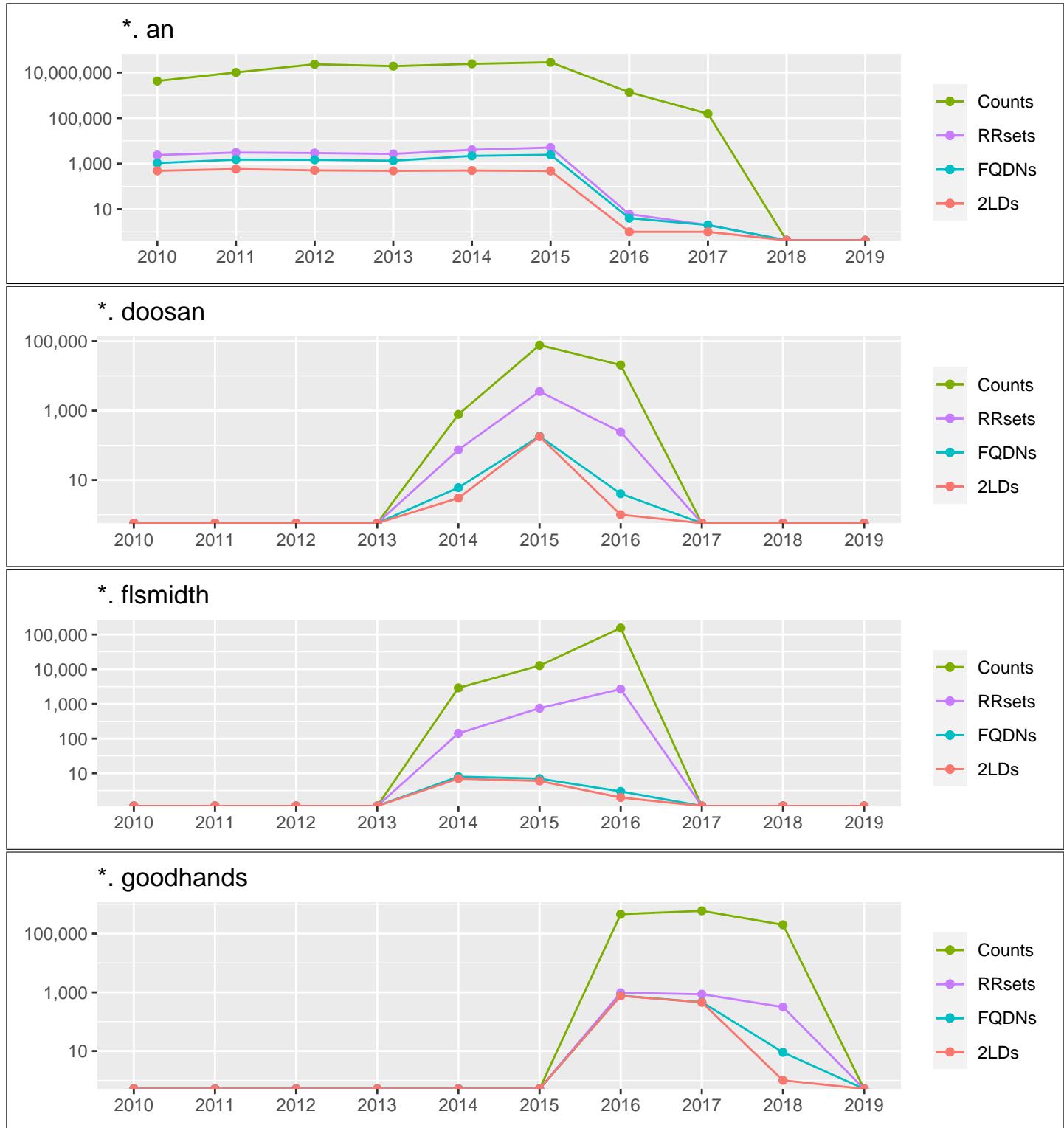


*. zuerich

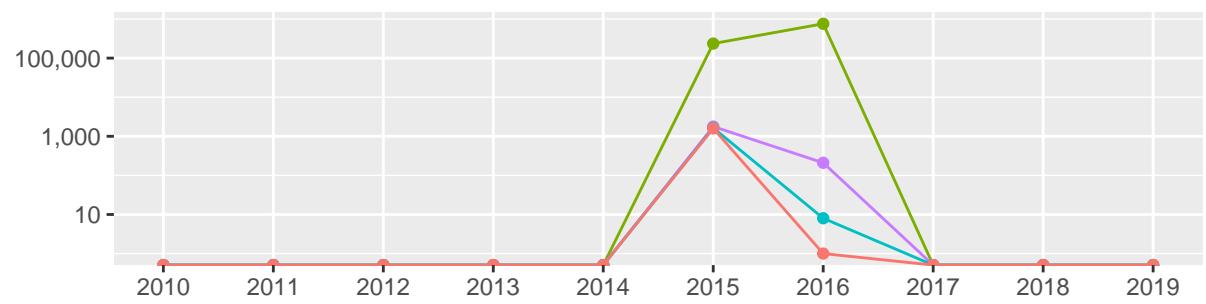


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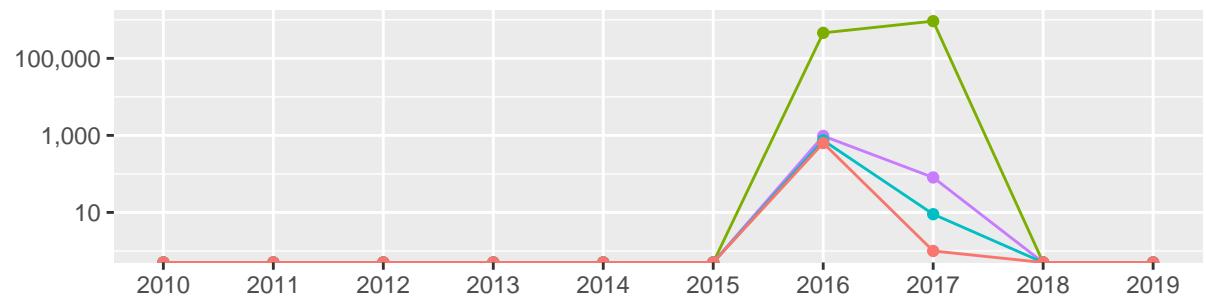
Revoked/Retired TLDs



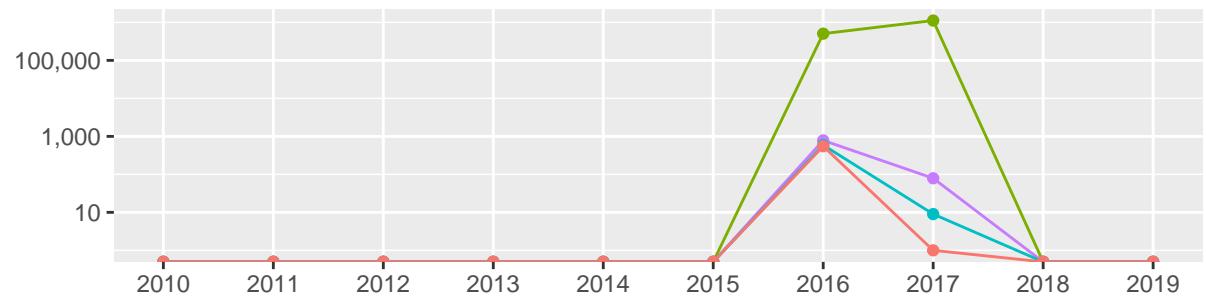
*. iinet



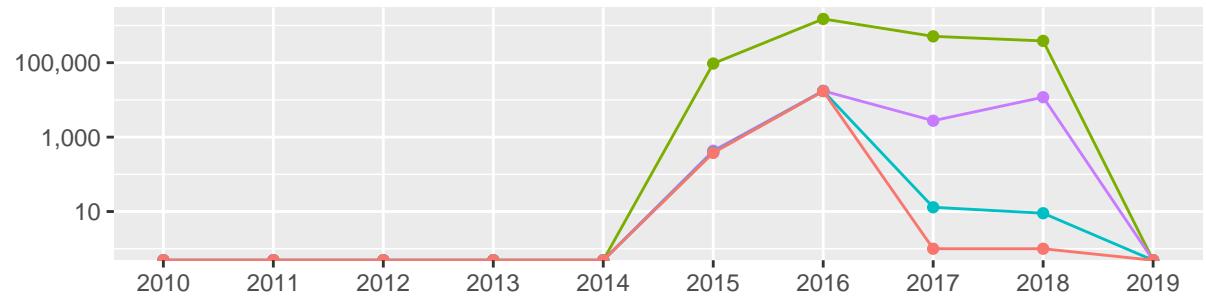
*. mcd



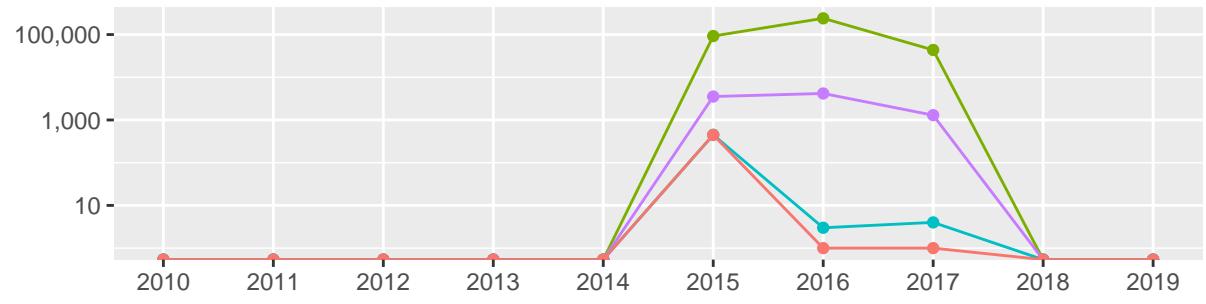
*. mcdonalds

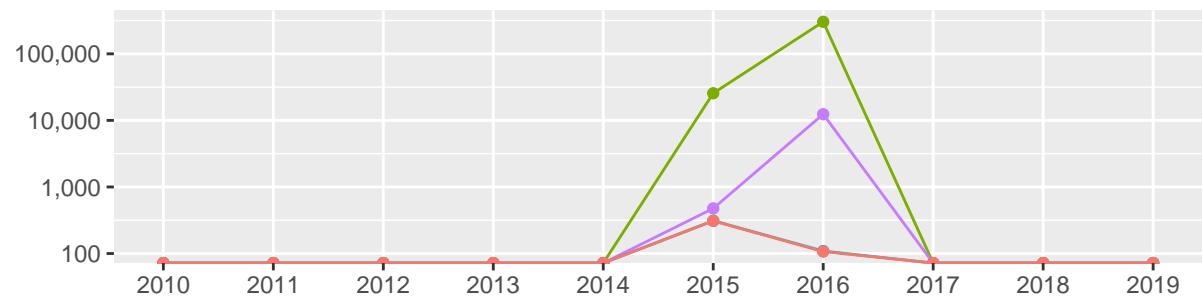
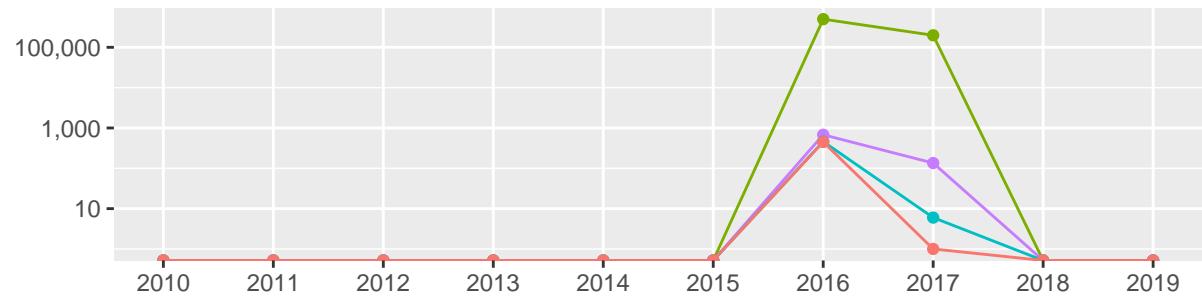
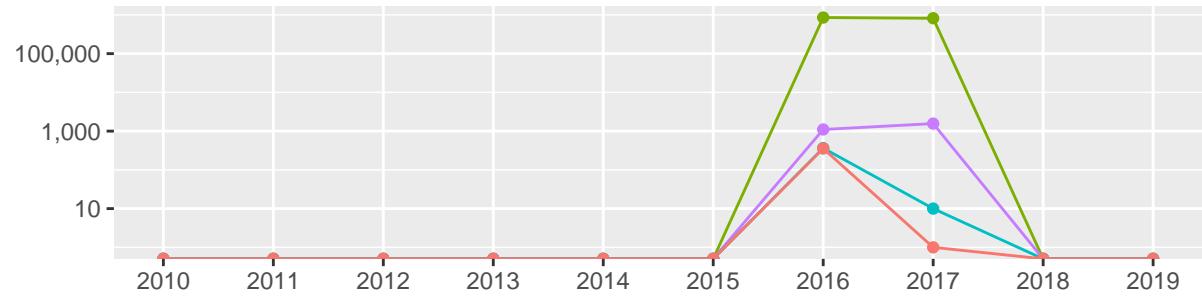
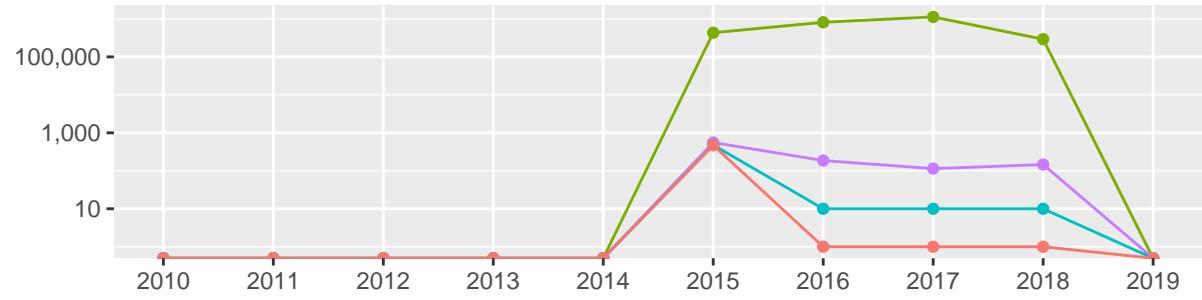
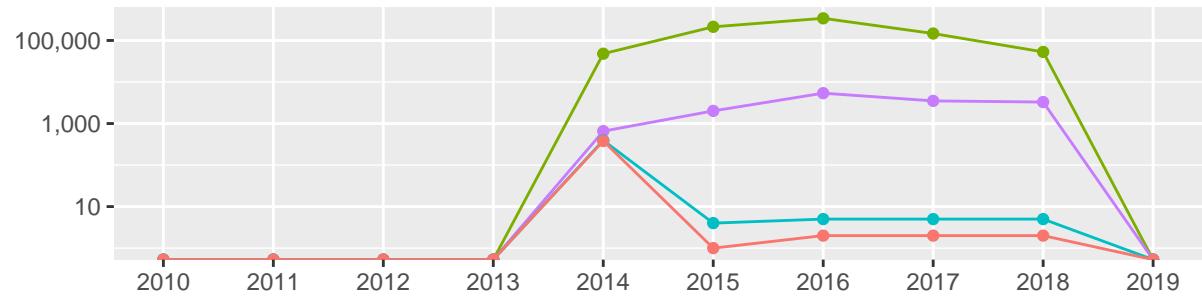


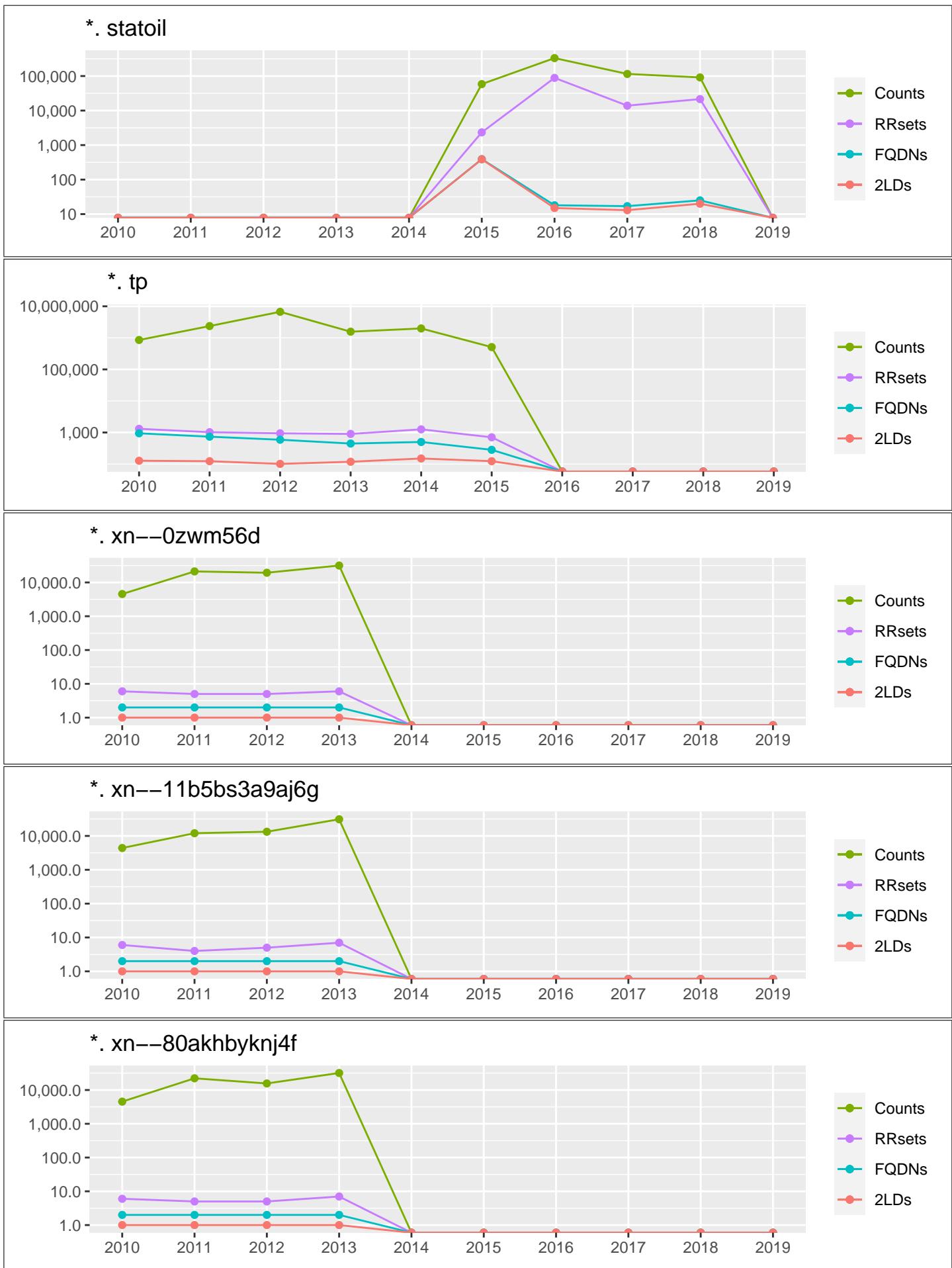
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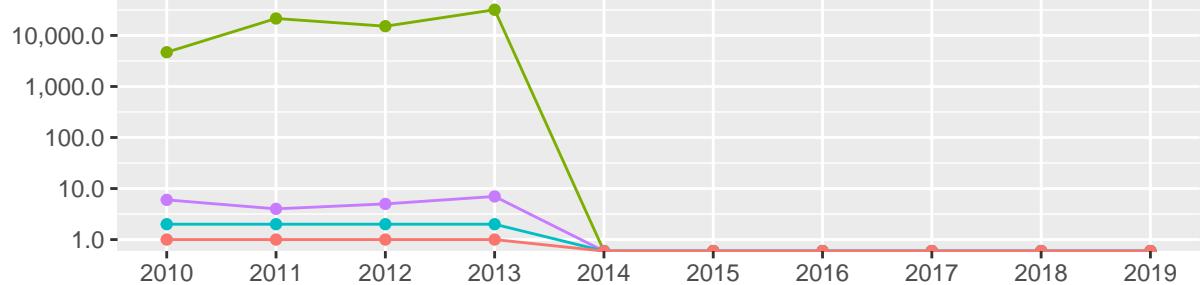
*. mtpc



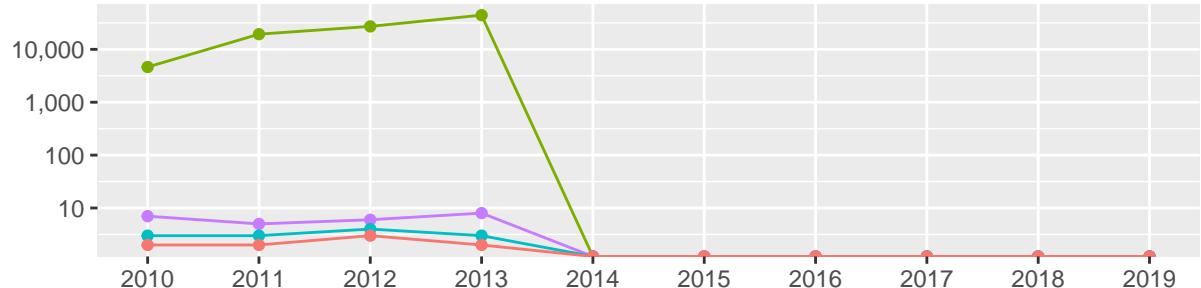
. mutuelle**. orientexpress*****. pamperedchef*****. panerai*****. spiegel**



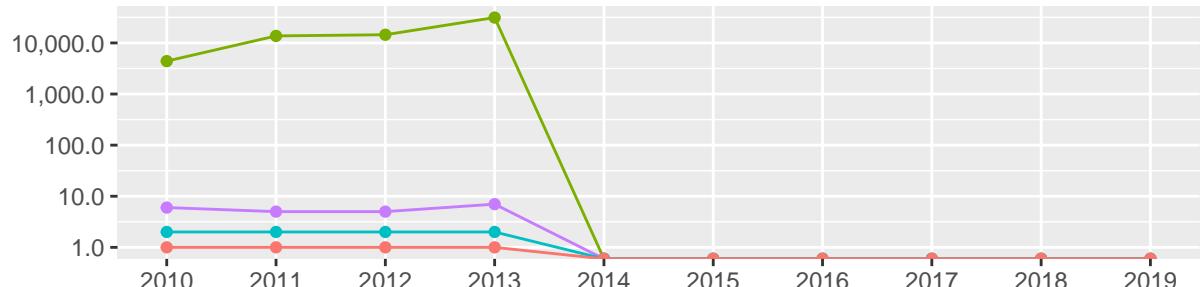
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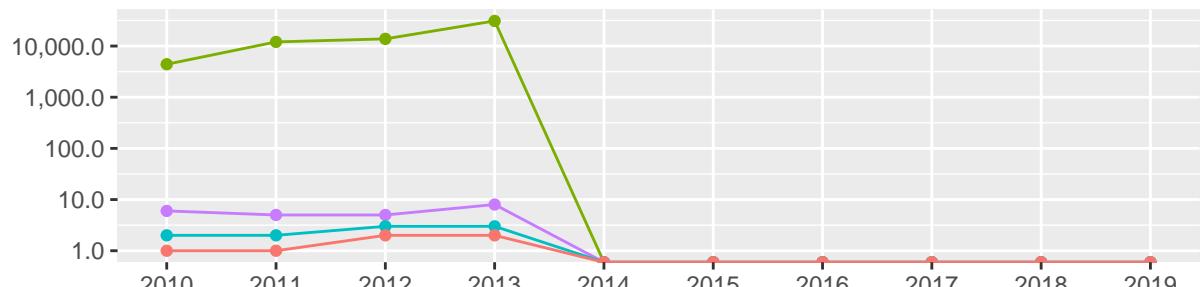
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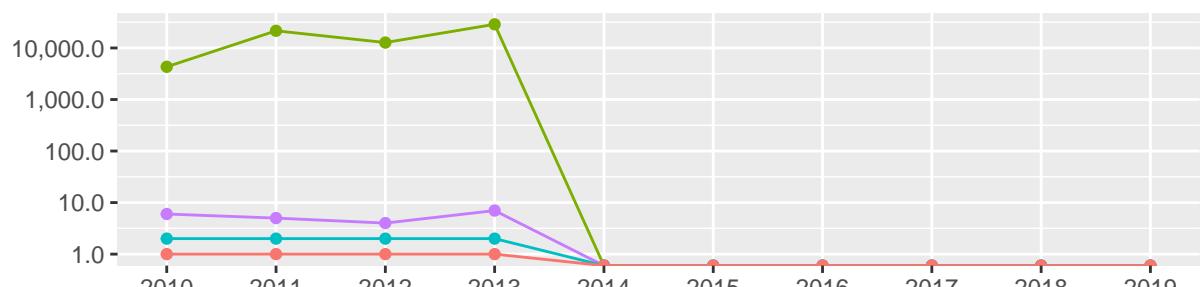
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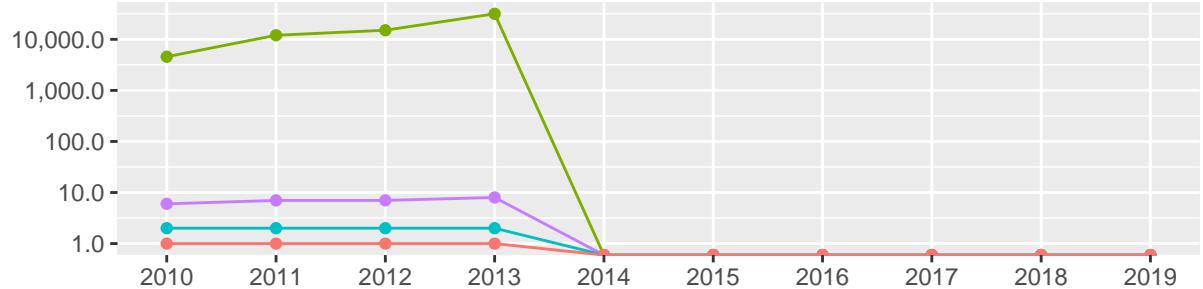
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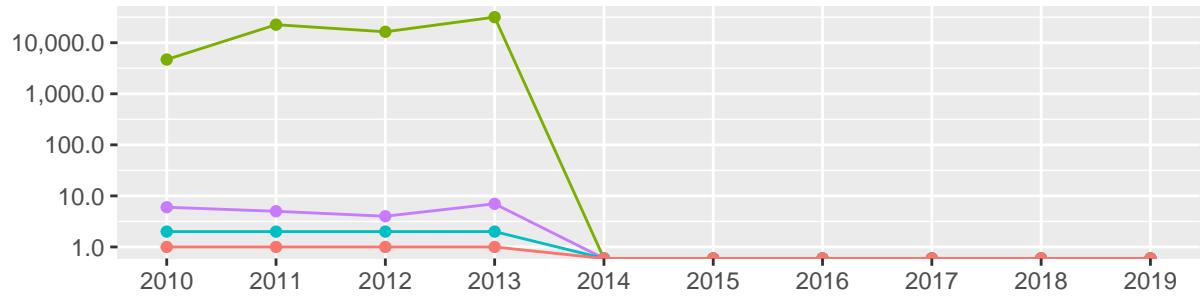
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*. xn--jxalpdip

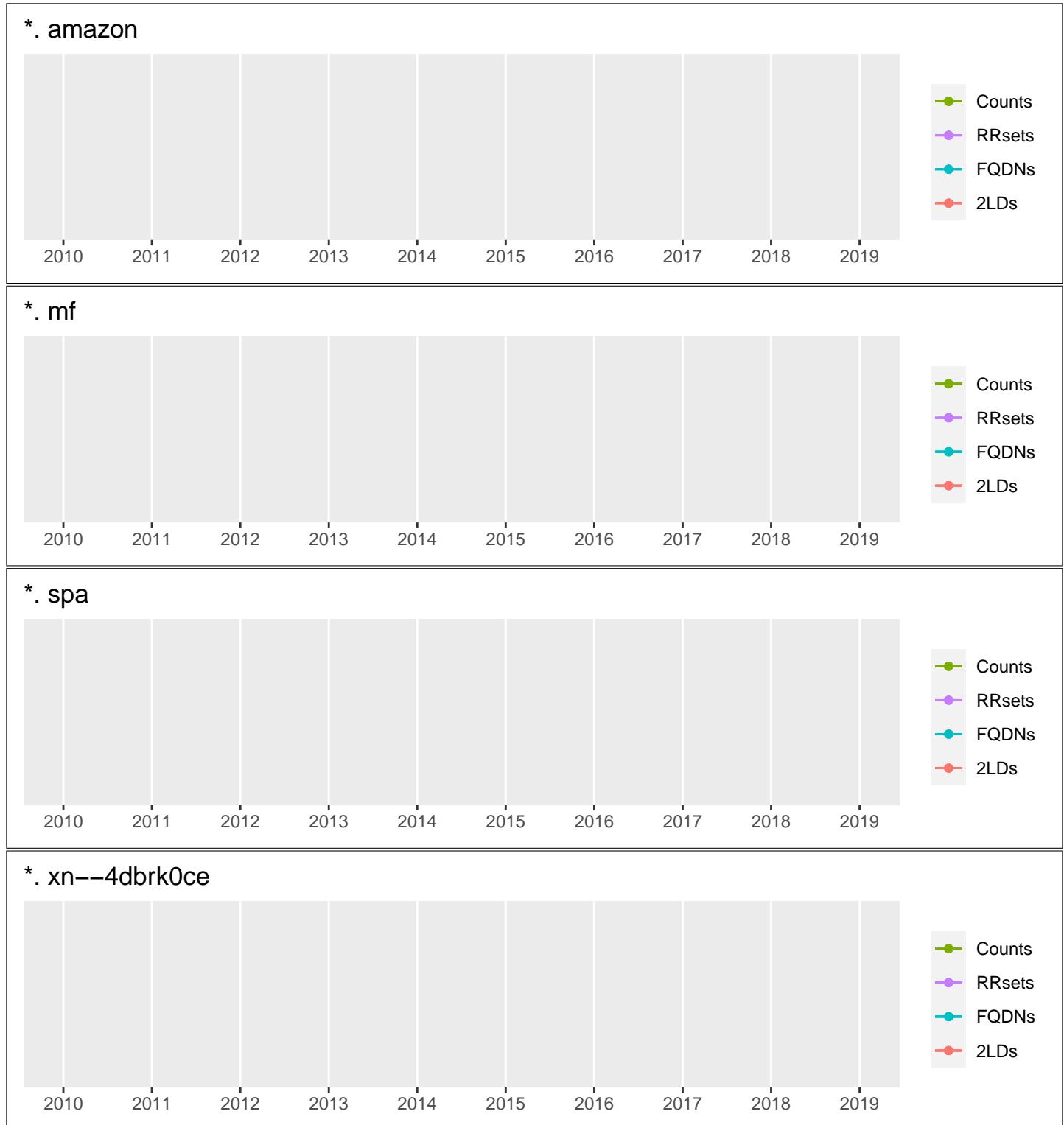


*. xn--kgbechtv

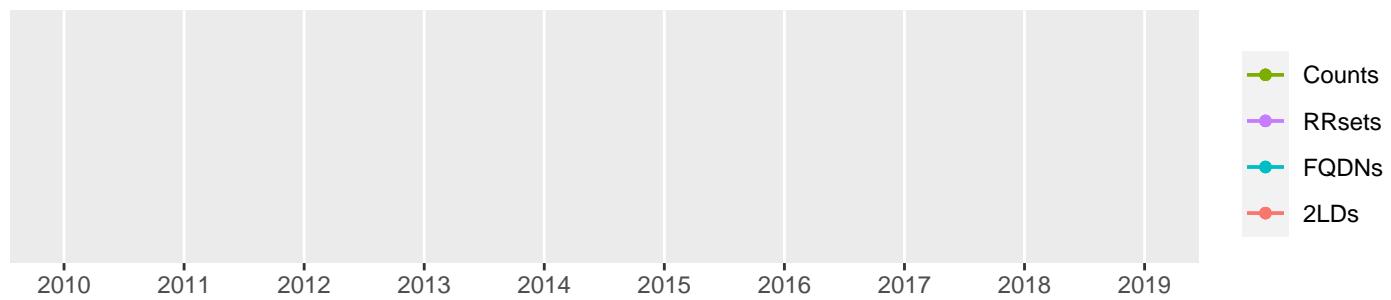


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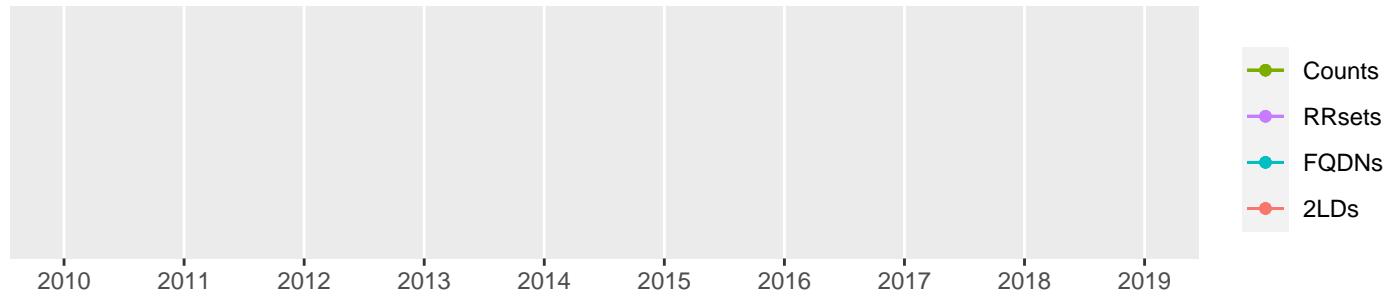
TLDs with no traffic 6/2010-12/2019



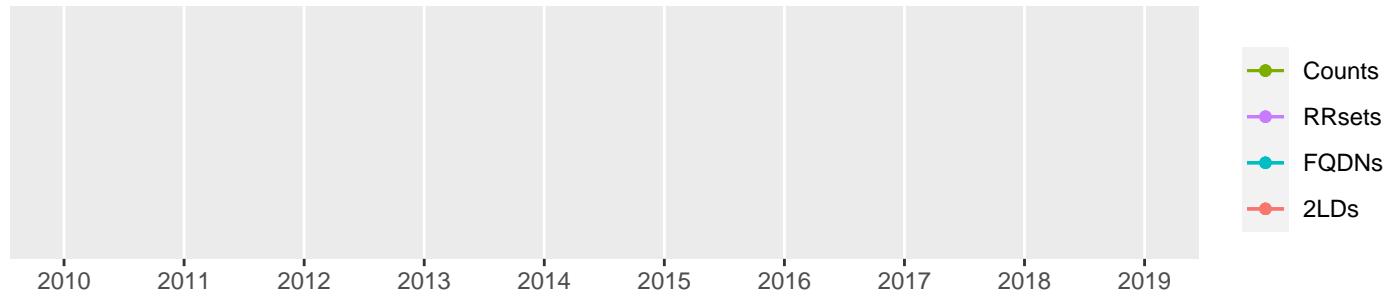
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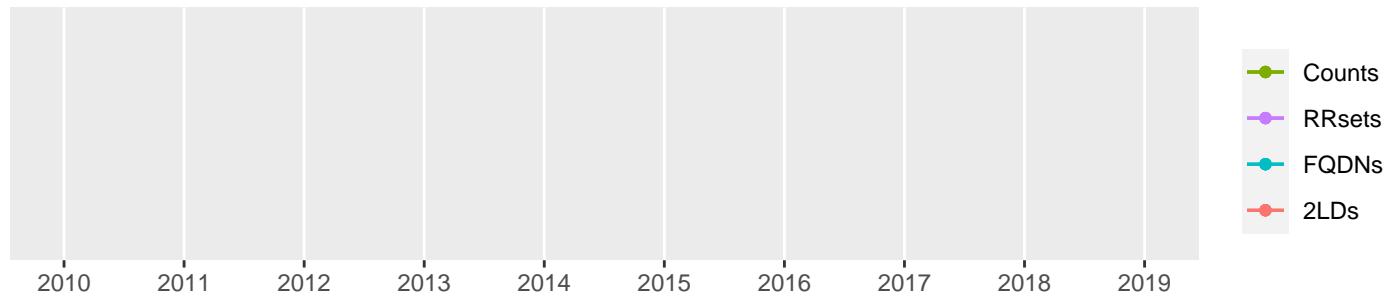
*. xn--jlq480n2rg



*. xn--mgbcpq6gpa1a



*. xn--q7ce6a



Chapter 12

Conclusion

You've now had the chance to see how each IANA TLD evolved in DNSDB over the ten-year period from 2010 to 2019, as tracked by four metrics:

- **Sum of Counts**
- **Total RRsets**
- **Unique fully qualified domain names (FQDNs)**
- **Unique second level domains (2LDs)**

We've intentionally refrained from stating the obvious in the body of this report, confident that you, the reader, can draw your own conclusions about the various TLDs and their volumetric success (or lack thereof).

One caution in that regard: not all TLDs were created to battle for marketshare. Some TLDs have intentionally been created and reserved for more exclusive purposes, in which case criticizing them for limited market uptake would be totally missing the point of their creation.

While we've intentionally aggregated this report at the level of TLDs, and tracked data on a yearly granularity, we could just as easily have reported on individual effective second-level domains (e.g., delegation points) on a monthly or even daily basis, and in fact we've done so for a variety of second-level domains as part of a separate study on the impact of Covid-19 on DNS traffic (see "A Year of Passive DNS During the Pandemic"). We encourage you to check it out as well.

Appendix: R code for the report's graphs

```

library(ggplot2)
library(tidyverse)
library(scales)

mydata <- read.csv("all-domains.output", sep = "\t", row.names=NULL,
  col.names=c("Date", "Domain", "RRsets", "FQDNs", "TwoLDs", "Count"))

for (var in unique(mydata$Domain)) {

  pdf(paste(var, '-dotplot', '.pdf', sep=""), height=1.9, width=7.38)

  print(ggplot(mydata[mydata$Domain==var,], aes(x=Date)) +
    geom_point(aes(y=Count, color="Counts")) +
    geom_line(aes(y=Count, color="Counts")) +
    geom_point(aes(y=RRsets, color="RRsets")) +
    geom_line(aes(y=RRsets, color="RRsets")) +
    geom_point(aes(y=FQDNs, color="FQDNs")) +
    geom_line(aes(y=FQDNs, color="FQDNs")) +
    geom_point(aes(y=TwoLDs, color="2LDs")) +
    geom_line(aes(y=TwoLDs, color="2LDs")) +
    ggtitle(paste("*.", var)) +
    scale_x_continuous(breaks=c(2010,2011,2012,2013,2014,2015,
      2016,2017,2018,2019)) +
    scale_y_continuous(labels=comma, trans='log10')+
    theme(panel.grid.minor.x=element_blank(),
          legend.title=element_blank(),
          axis.title.x=element_blank(),
          axis.title.y=element_blank()) +
    scale_color_discrete(breaks=c("Counts", "RRsets", "FQDNs", "2LDs")))

  dev.off()
}

```

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