Copy of Exploratory

November 6, 2022

[1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import warnings
import seaborn as sns

warnings.filterwarnings('ignore')
```

[2]:
```
#df = pd.read_csv(r'/2021_OPM_FEVS_PRDF.csv)
df = pd.read_csv(r'/home/brady/dataBC/code-2022/2022Project/FEVS2021_PRDF_CSV/
 ↪2021_OPM_FEVS_PRDF.csv')
## Checking if there are any duplicate values
df
```

[2]:

	RandomID	agency	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	…	DRNO	DHISP	\
0	112970976817	XX	5.0	5.0	5.0	5.0	5	4	4	4	…	A	B	
1	194868625278	XX	3.0	2.0	4.0	3.0	4	2	4	2	…	NaN	A	
2	152966380283	XX	5.0	5.0	4.0	4.0	3	4	5	4	…	B	B	
3	193041162980	XX	5.0	5.0	5.0	5.0	5	5	5	5	…	B	B	
4	146655962451	XX	4.0	5.0	5.0	4.0	4	3	5	4	…	B	B	
…	…	…	…	…	…	…	..	..	..	..	…	…	…	
292515	154057939422	ST	3.0	4.0	4.0	3.0	4	4	2	4	…	B	B	
292516	151758964104	ST	3.0	4.0	2.0	4.0	2	2	3	3	…	B	B	
292517	143492802997	ST	3.0	3.0	NaN	4.0	4	4	4	3	…	NaN	NaN	
292518	110267537558	ST	2.0	4.0	5.0	5.0	2	1	5	4	…	B	B	
292519	153195177928	ST	4.0	4.0	5.0	5.0	4	3	5	4	…	B	B	

	DDIS	DAGEGRP	DSUPER	DFEDTEN	DSEX	DMIL	DLEAVING	POSTWT
0	B	B	B	A	A	A	A	2.209652
1	B	B	B	B	A	A	C	2.209652
2	B	B	A	B	A	B	C	1.858874
3	A	B	B	B	A	A	A	1.228573
4	B	B	B	B	A	A	A	1.735842
…	…	…	…	…	…	…	…	…
292515	B	A	A	A	B	B	A	3.004992
292516	B	A	A	A	B	B	D	4.427855
292517	NaN	NaN	NaN	A	A	NaN	A	4.202227

```
292518    B       A      A       A    B    B        C  3.523113
292519    A       B      A       A    A    B        A  3.400784

[292520 rows x 79 columns]
```

[3]:
```
df.drop_duplicates() ##dropping all the duplicate values
print()
print(df.info())  ##checking the data types of every column
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 292520 entries, 0 to 292519
Data columns (total 79 columns):
 #   Column    Non-Null Count   Dtype
---  ------    --------------   -----
 0   RandomID  292520 non-null  int64
 1   agency    292520 non-null  object
 2   Q1        291074 non-null  float64
 3   Q2        288624 non-null  float64
 4   Q3        290112 non-null  float64
 5   Q4        291324 non-null  float64
 6   Q5        290770 non-null  object
 7   Q6        286449 non-null  object
 8   Q7        290240 non-null  object
 9   Q8        291451 non-null  object
 10  Q9        291910 non-null  float64
 11  Q10       292038 non-null  object
 12  Q11       292018 non-null  object
 13  Q12       291755 non-null  object
 14  Q13       291920 non-null  object
 15  Q14       291306 non-null  object
 16  Q15       288257 non-null  object
 17  Q16       290367 non-null  object
 18  Q17       290268 non-null  object
 19  Q18       291274 non-null  object
 20  Q19       291402 non-null  object
 21  Q20       289926 non-null  object
 22  Q21       290110 non-null  object
 23  Q22       290350 non-null  object
 24  Q23       289942 non-null  float64
 25  Q24       290169 non-null  object
 26  Q25       289267 non-null  object
 27  Q26       288926 non-null  object
 28  Q27       289019 non-null  object
 29  Q28       287561 non-null  float64
 30  Q29       287462 non-null  float64
 31  Q30       287369 non-null  float64
```

```
 32  Q31         288152 non-null  float64
 33  Q32         286521 non-null  object
 34  Q33         285246 non-null  object
 35  Q34         285497 non-null  object
 36  Q35         285918 non-null  object
 37  Q36         285299 non-null  object
 38  Q37         285213 non-null  object
 39  Q38         285251 non-null  object
 40  Q39         283445 non-null  float64
 41  Q40         282267 non-null  float64
 42  Q41         282219 non-null  float64
 43  Q42         281587 non-null  float64
 44  Q43         282840 non-null  float64
 45  Q44         283310 non-null  float64
 46  Q45         283136 non-null  float64
 47  Q46         282920 non-null  float64
 48  Q47_01      279206 non-null  float64
 49  Q47_02      277687 non-null  float64
 50  Q47_03      276577 non-null  float64
 51  Q47_04      277660 non-null  float64
 52  Q47_05      279221 non-null  float64
 53  Q47_06      278977 non-null  float64
 54  Q47_07      279162 non-null  float64
 55  Q47_08      279571 non-null  float64
 56  Q47_09      279786 non-null  float64
 57  Q47_10      278113 non-null  float64
 58  Q47_11      277685 non-null  float64
 59  Q48         280356 non-null  object
 60  Q49         279335 non-null  object
 61  Q50         278898 non-null  object
 62  Q51         280182 non-null  object
 63  Q52         279772 non-null  object
 64  Q53         279702 non-null  object
 65  Q54         280570 non-null  float64
 66  Q55         279820 non-null  object
 67  Q56         279481 non-null  object
 68  Q57         279607 non-null  object
 69  DRNO        240635 non-null  object
 70  DHISP       253732 non-null  object
 71  DDIS        258336 non-null  object
 72  DAGEGRP     260285 non-null  object
 73  DSUPER      272402 non-null  object
 74  DFEDTEN     272112 non-null  object
 75  DSEX        260998 non-null  object
 76  DMIL        272565 non-null  object
 77  DLEAVING    273309 non-null  object
 78  POSTWT      292520 non-null  float64
dtypes: float64(31), int64(1), object(47)
```

```
memory usage: 176.3+ MB
None
```

[4]:
```
## There are certain variables which should be nature but they are not because␣
 ↪some of the entries have string value.
df_c  = df.copy()
objects= [column for column, is_type in (df_c.dtypes=="object").items() if␣
 ↪is_type] ## Extracting out all the value which should be integar but is not
## The column 'agency' holds no significance here so it is to be dropped.
objects.remove('agency')
for i in objects:
    df_c[i] = df_c[i].replace(['X'], np.nan)
    df_c[i] = df_c[i].replace(np.nan, 0)
df_c.isnull().sum().sum()
```

[4]:
```
276131
```

[5]:
```
objects[:-9]
for i in objects[:-9]:
    df_c[i] = df_c[i].astype(float)
df_c.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 292520 entries, 0 to 292519
Data columns (total 79 columns):
 #   Column    Non-Null Count   Dtype
---  ------    --------------   -----
 0   RandomID  292520 non-null  int64
 1   agency    292520 non-null  object
 2   Q1        291074 non-null  float64
 3   Q2        288624 non-null  float64
 4   Q3        290112 non-null  float64
 5   Q4        291324 non-null  float64
 6   Q5        292520 non-null  float64
 7   Q6        292520 non-null  float64
 8   Q7        292520 non-null  float64
 9   Q8        292520 non-null  float64
 10  Q9        291910 non-null  float64
 11  Q10       292520 non-null  float64
 12  Q11       292520 non-null  float64
 13  Q12       292520 non-null  float64
 14  Q13       292520 non-null  float64
 15  Q14       292520 non-null  float64
 16  Q15       292520 non-null  float64
 17  Q16       292520 non-null  float64
 18  Q17       292520 non-null  float64
 19  Q18       292520 non-null  float64
 20  Q19       292520 non-null  float64
```

```
21  Q20       292520 non-null  float64
22  Q21       292520 non-null  float64
23  Q22       292520 non-null  float64
24  Q23       289942 non-null  float64
25  Q24       292520 non-null  float64
26  Q25       292520 non-null  float64
27  Q26       292520 non-null  float64
28  Q27       292520 non-null  float64
29  Q28       287561 non-null  float64
30  Q29       287462 non-null  float64
31  Q30       287369 non-null  float64
32  Q31       288152 non-null  float64
33  Q32       292520 non-null  float64
34  Q33       292520 non-null  float64
35  Q34       292520 non-null  float64
36  Q35       292520 non-null  float64
37  Q36       292520 non-null  float64
38  Q37       292520 non-null  float64
39  Q38       292520 non-null  float64
40  Q39       283445 non-null  float64
41  Q40       282267 non-null  float64
42  Q41       282219 non-null  float64
43  Q42       281587 non-null  float64
44  Q43       282840 non-null  float64
45  Q44       283310 non-null  float64
46  Q45       283136 non-null  float64
47  Q46       282920 non-null  float64
48  Q47_01    279206 non-null  float64
49  Q47_02    277687 non-null  float64
50  Q47_03    276577 non-null  float64
51  Q47_04    277660 non-null  float64
52  Q47_05    279221 non-null  float64
53  Q47_06    278977 non-null  float64
54  Q47_07    279162 non-null  float64
55  Q47_08    279571 non-null  float64
56  Q47_09    279786 non-null  float64
57  Q47_10    278113 non-null  float64
58  Q47_11    277685 non-null  float64
59  Q48       292520 non-null  float64
60  Q49       292520 non-null  float64
61  Q50       292520 non-null  float64
62  Q51       292520 non-null  float64
63  Q52       292520 non-null  float64
64  Q53       292520 non-null  float64
65  Q54       280570 non-null  float64
66  Q55       292520 non-null  float64
67  Q56       292520 non-null  float64
68  Q57       292520 non-null  float64
```

```
 69  DRNO       292520 non-null  object
 70  DHISP      292520 non-null  object
 71  DDIS       292520 non-null  object
 72  DAGEGRP    292520 non-null  object
 73  DSUPER     292520 non-null  object
 74  DFEDTEN    292520 non-null  object
 75  DSEX       292520 non-null  object
 76  DMIL       292520 non-null  object
 77  DLEAVING   292520 non-null  object
 78  POSTWT     292520 non-null  float64
dtypes: float64(68), int64(1), object(10)
memory usage: 176.3+ MB
```

[6]:
```
df_c = df_c.dropna()
df_c.isnull().sum().sum() ##-> No missing values found in the dataset
```

[6]:
```
0
```

[7]:
```
print('The number of survey entries altered:',df.shape[0]-df_c.shape[0])
print('The percentage of alterations from the original dataset is: ',round(((df.
  ↪shape[0]-df_c.shape[0])/(df.shape[0])),2)*100,'%')
```

```
The number of survey entries altered: 54401
The percentage of alterations from the original dataset is:  19.0 %
```

[8]:
```
#check
df_ca = df_c.copy()
for i in df_ca.columns.values:
        df_ca[i] = df_ca[i].replace(0,df_ca[i].value_counts().idxmax())


df_ca.head(20)
```

[8]:

	RandomID	agency	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	…	DRNO	\
0	112970976817	XX	5.0	5.0	5.0	5.0	5.0	4.0	4.0	4.0	…	A	
2	152966380283	XX	5.0	5.0	4.0	4.0	3.0	4.0	5.0	4.0	…	B	
3	193041162980	XX	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	…	B	
4	146655962451	XX	4.0	5.0	5.0	4.0	4.0	3.0	5.0	4.0	…	B	
5	195312241136	XX	4.0	3.0	4.0	4.0	4.0	4.0	4.0	3.0	…	A	
6	187815423862	XX	5.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	…	B	
7	174698178690	XX	1.0	1.0	2.0	1.0	3.0	1.0	2.0	2.0	…	B	
9	138139604049	XX	4.0	4.0	5.0	4.0	4.0	4.0	4.0	4.0	…	B	
10	172119452278	XX	4.0	4.0	4.0	4.0	5.0	4.0	4.0	4.0	…	B	
11	102302785265	XX	4.0	3.0	4.0	4.0	3.0	4.0	4.0	3.0	…	B	
12	135019931353	XX	4.0	4.0	5.0	5.0	2.0	2.0	4.0	4.0	…	B	
13	105078979724	XX	2.0	3.0	3.0	4.0	1.0	2.0	4.0	3.0	…	B	
14	139579921467	XX	4.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	…	B	
15	146904434378	XX	1.0	1.0	5.0	1.0	4.0	2.0	5.0	5.0	…	B	

```
16  161966059804     XX  4.0  5.0  3.0  4.0  4.0  4.0  4.0  5.0  …     B
17  143546472323     XX  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  …     B
18  186289810894     XX  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  …     B
20  104701506907     XX  5.0  5.0  5.0  5.0  2.0  5.0  5.0  4.0  …     B
21  191607232108     XX  2.0  3.0  5.0  5.0  2.0  4.0  3.0  2.0  …     B
23  102384121624     XX  3.0  4.0  4.0  4.0  5.0  4.0  4.0  2.0  …     B

    DHISP  DDIS  DAGEGRP  DSUPER  DFEDTEN  DSEX  DMIL  DLEAVING    POSTWT
0       B     B        B       B        A     A     A         A  2.209652
2       B     B        B       A        B     A     B         C  1.858874
3       B     A        B       B        B     A     A         A  1.228573
4       B     B        B       B        B     A     A         A  1.735842
5       B     B        B       A        B     B     A         A  2.076046
6       B     B        B       B        B     A     A         A  1.858874
7       B     B        B       A        B     B     B         C  1.089288
9       B     A        B       B        A     A     A         A  1.228573
10      B     B        B       B        C     A     A         A  1.735842
11      B     B        B       B        B     A     A         A  1.228573
12      B     B        B       B        B     B     B         A  1.089288
13      B     B        B       B        A     A     B         C  2.209652
14      B     B        B       A        A     A     B         A  1.735842
15      B     B        B       A        B     A     A         C  2.209652
16      B     A        A       A        A     A     A         A  2.010048
17      B     B        B       B        A     B     A         A  1.184402
18      B     B        B       B        A     B     A         A  1.255264
20      B     B        B       A        B     B     B         A  1.184402
21      B     B        B       B        B     A     A         C  1.735842
23      A     B        B       A        A     B     B         A  1.020346

[20 rows x 79 columns]
```

[9]:
```
df_ca['DLEAVING'].value_counts()
```

[9]:
```
A    160269
C     36912
B     29899
D     11039
Name: DLEAVING, dtype: int64
```

[10]:
```
df_ca.loc[df_ca.DLEAVING=='C']
```

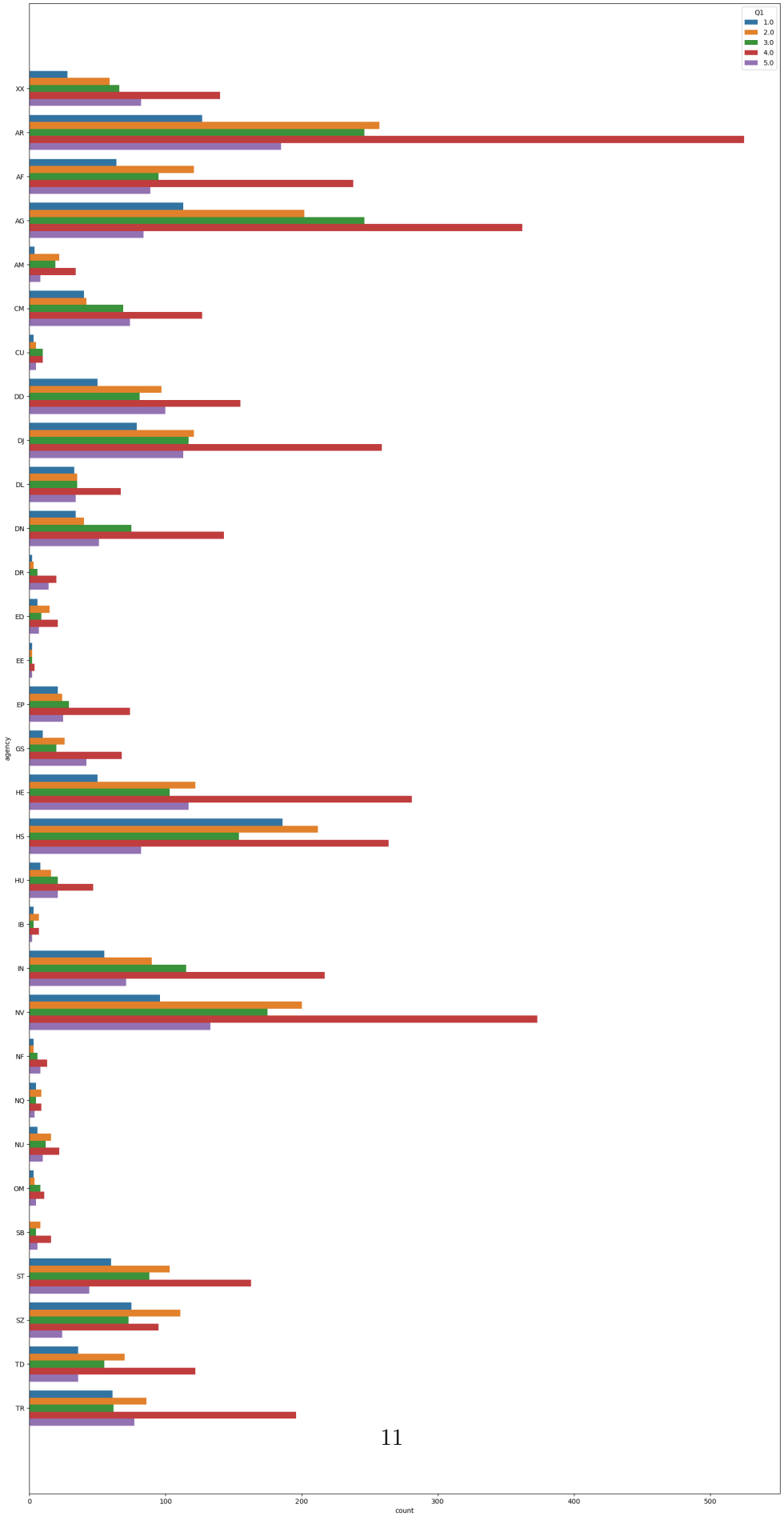
[10]:
```
            RandomID agency   Q1   Q2   Q3   Q4   Q5   Q6   Q7   Q8  … \
2       152966380283     XX  5.0  5.0  4.0  4.0  3.0  4.0  5.0  4.0  …
7       174698178690     XX  1.0  1.0  2.0  1.0  3.0  1.0  2.0  2.0  …
13      105078979724     XX  2.0  3.0  3.0  4.0  1.0  2.0  4.0  3.0  …
15      146904434378     XX  1.0  1.0  5.0  1.0  4.0  2.0  5.0  5.0  …
21      191607232108     XX  2.0  3.0  5.0  5.0  2.0  4.0  3.0  2.0  …
```

```
…              …    …  …  …  …  …  …  …  …  …  …
292401  149388396809     ST  4.0  4.0  4.0  4.0  2.0  2.0  2.0  4.0  …
292435  183028010363     ST  2.0  2.0  2.0  2.0  2.0  2.0  4.0  3.0  …
292440  148021669661     ST  4.0  4.0  3.0  4.0  1.0  4.0  4.0  5.0  …
292486  185461910015     ST  1.0  2.0  1.0  3.0  4.0  1.0  5.0  1.0  …
292518  110267537558     ST  2.0  4.0  5.0  5.0  2.0  1.0  5.0  4.0  …

        DRNO  DHISP  DDIS  DAGEGRP  DSUPER  DFEDTEN  DSEX  DMIL  DLEAVING  \
2          B      B     B        B       A        B     A     B         C
7          B      B     B        B       A        B     B     B         C
13         B      B     B        B       B        A     A     B         C
15         B      B     B        B       A        B     A     A         C
21         B      B     B        B       B        B     A     A         C
…      …    …    …       …      …       …    …    …        …
292401     B      B     B        A       B        A     A     B         C
292435     B      B     B        A       B        B     B     B         C
292440     B      A     B        A       A        A     B     B         C
292486     A      B     B        A       B        A     B     B         C
292518     B      B     B        A       A        A     B     B         C

          POSTWT
2       1.858874
7       1.089288
13      2.209652
15      2.209652
21      1.735842
…            …
292401  3.957027
292435  2.705716
292440  1.955644
292486  4.662723
292518  3.523113

[36912 rows x 79 columns]
```

[11]:
```
df_ca_d = df_ca.loc[df_ca.DLEAVING=='D']

cols = df_ca_d.columns[2:45]
objects = [column for column, is_type in (df_ca_d.dtypes=="float").items() if␣
 ↪is_type]

for i in objects:
    plt.figure(figsize=(20,40))
    sns.countplot(data=df_ca_d[cols],y=df_ca_d['agency'],hue=i)
    plt.plot()

plt.savefig("dLeavingB.png")
```

```
---------------------------------------------------------------------------
ValueError                                Traceback (most recent call last)
Input In [11], in <cell line: 6>()
      6 for i in objects:
      7     plt.figure(figsize=(20,40))
----> 8     sns.countplot(data=df_ca_d[cols],y=df_ca_d['agency'],hue=i)
      9     plt.plot()
     11 plt.savefig("dLeavingB.png")

File ~/anaconda3/envs/my-conda-env/lib/python3.10/site-packages/seaborn/
 ↪_decorators.py:46, in _deprecate_positional_args.<locals>.inner_f(*args,␣
 ↪**kwargs)
     36     warnings.warn(
     37         "Pass the following variable{} as {}keyword arg{}: {}. "
     38         "From version 0.12, the only valid positional argument "
   (…)
     43         FutureWarning
     44     )
     45 kwargs.update({k: arg for k, arg in zip(sig.parameters, args)})
---> 46 return f(**kwargs)

File ~/anaconda3/envs/my-conda-env/lib/python3.10/site-packages/seaborn/
 ↪categorical.py:3598, in countplot(x, y, hue, data, order, hue_order, orient,␣
 ↪color, palette, saturation, dodge, ax, **kwargs)
   3595 elif x is not None and y is not None:
   3596     raise ValueError("Cannot pass values for both `x` and `y`")
-> 3598 plotter = _CountPlotter(
   3599     x, y, hue, data, order, hue_order,
   3600     estimator, ci, n_boot, units, seed,
   3601     orient, color, palette, saturation,
   3602     errcolor, errwidth, capsize, dodge
   3603 )
   3605 plotter.value_label = "count"
   3607 if ax is None:

File ~/anaconda3/envs/my-conda-env/lib/python3.10/site-packages/seaborn/
 ↪categorical.py:1584, in _BarPlotter.__init__(self, x, y, hue, data, order,␣
 ↪hue_order, estimator, ci, n_boot, units, seed, orient, color, palette,␣
 ↪saturation, errcolor, errwidth, capsize, dodge)
   1579 def __init__(self, x, y, hue, data, order, hue_order,
   1580              estimator, ci, n_boot, units, seed,
   1581              orient, color, palette, saturation, errcolor,
   1582              errwidth, capsize, dodge):
   1583     """Initialize the plotter."""
-> 1584     self.establish_variables(x, y, hue, data, orient,
   1585                              order, hue_order, units)
   1586     self.establish_colors(color, palette, saturation)
   1587     self.estimate_statistic(estimator, ci, n_boot, seed)
```

```
File ~/anaconda3/envs/my-conda-env/lib/python3.10/site-packages/seaborn/
 ↪categorical.py:153, in _CategoricalPlotter.establish_variables(self, x, y,␣
 ↪hue, data, orient, order, hue_order, units)
    151     if isinstance(var, str):
    152         err = "Could not interpret input '{}'".format(var)
--> 153         raise ValueError(err)
    155 # Figure out the plotting orientation
    156 orient = infer_orient(
    157     x, y, orient, require_numeric=self.require_numeric
    158 )

ValueError: Could not interpret input 'Q44'
```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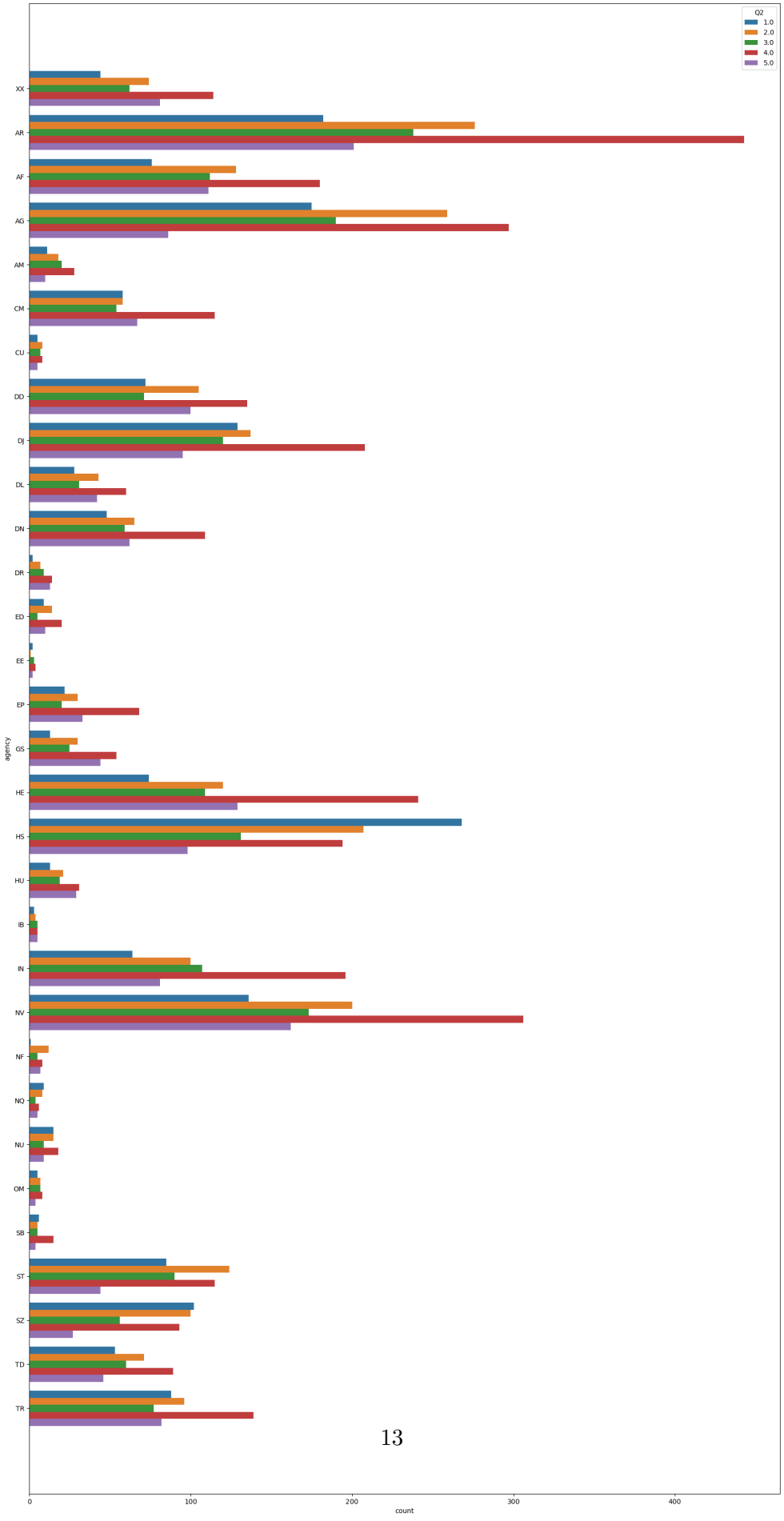
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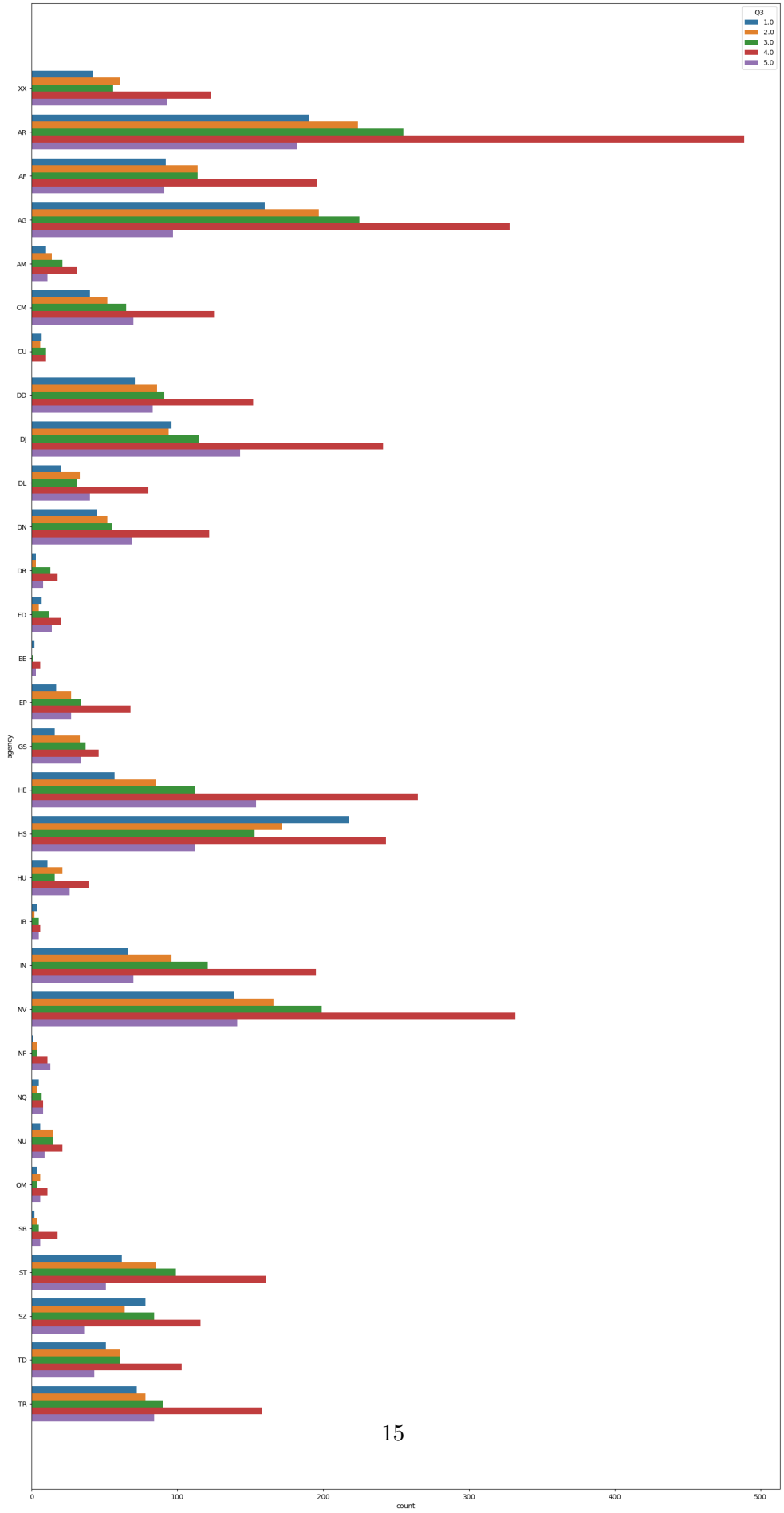
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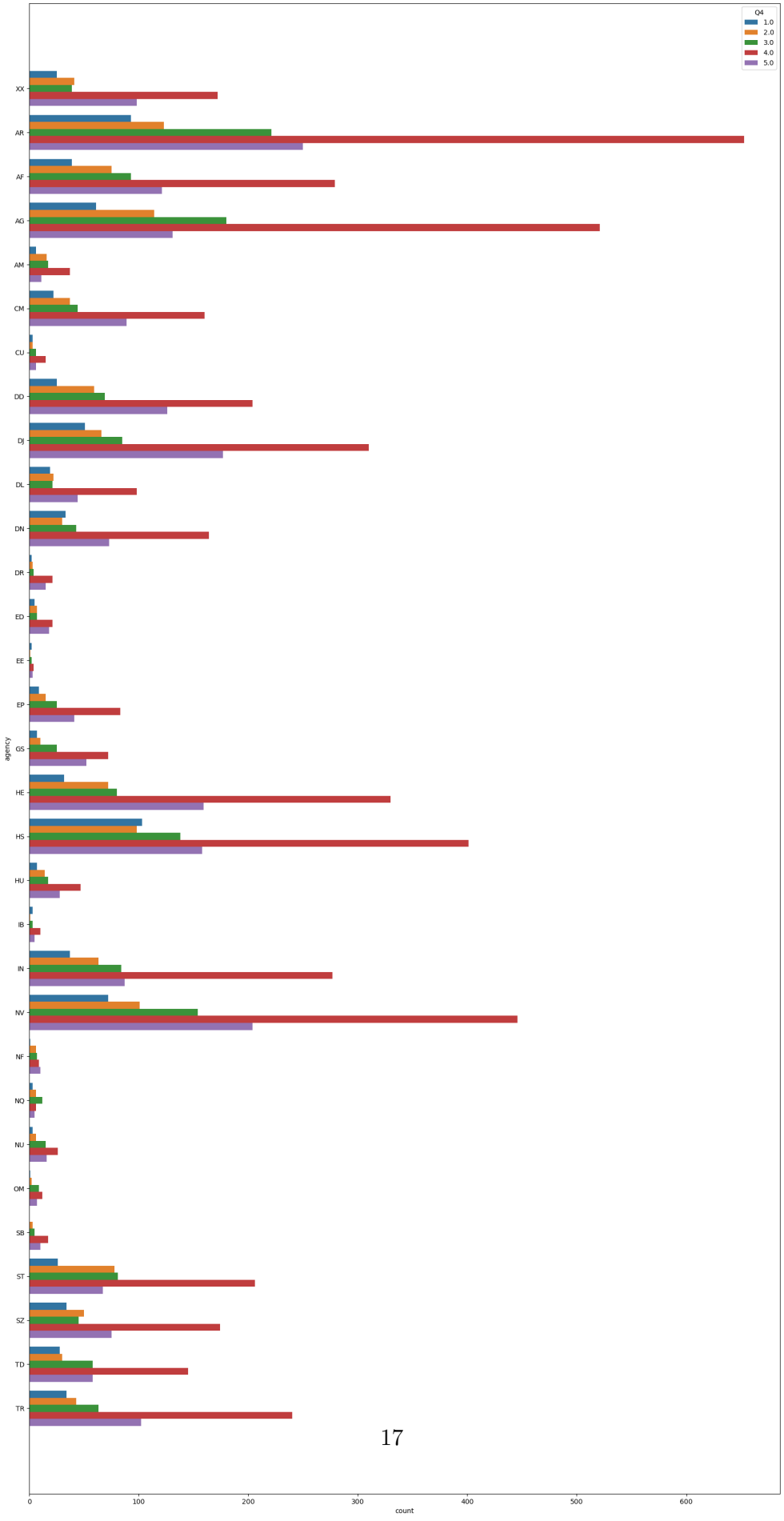
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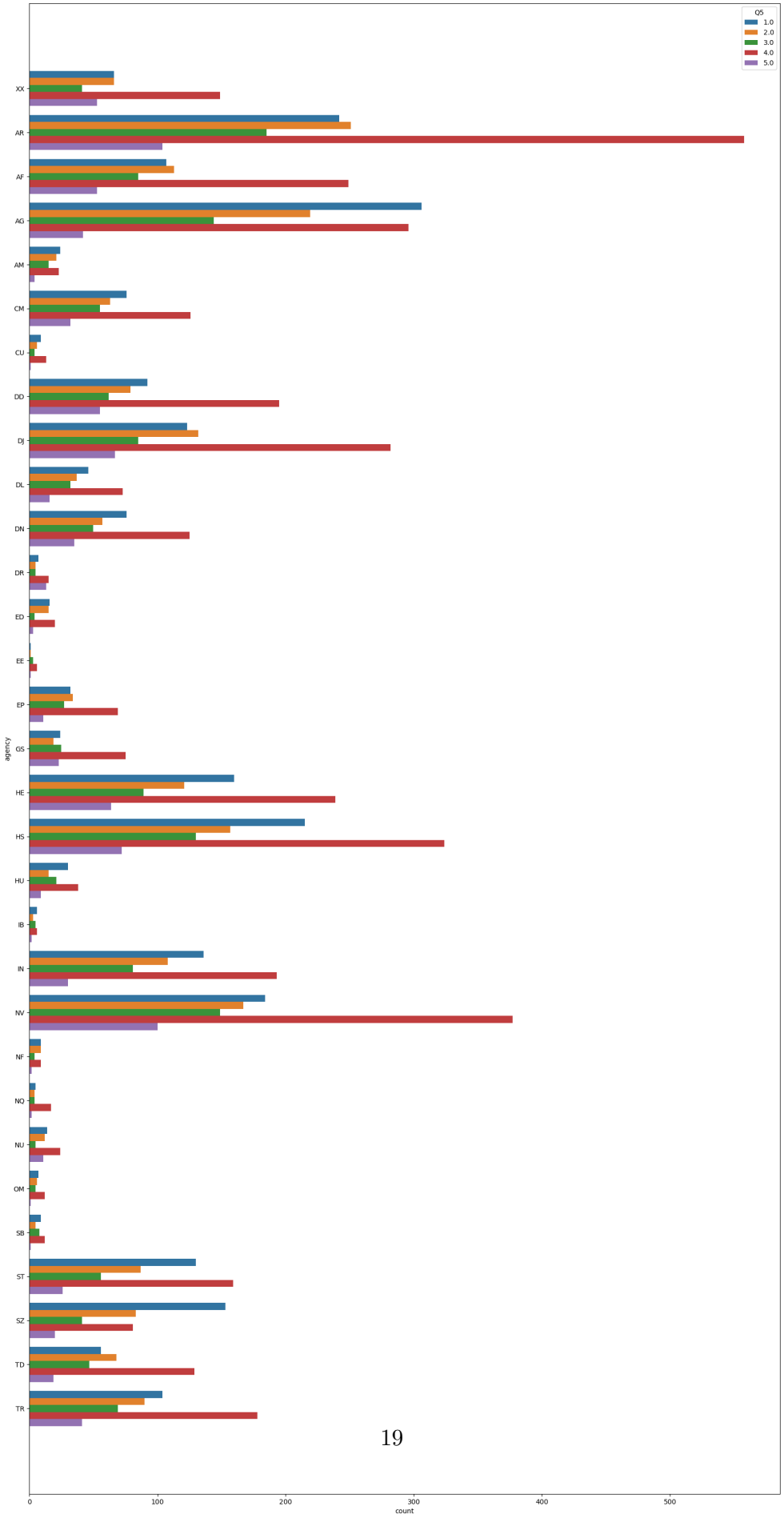
count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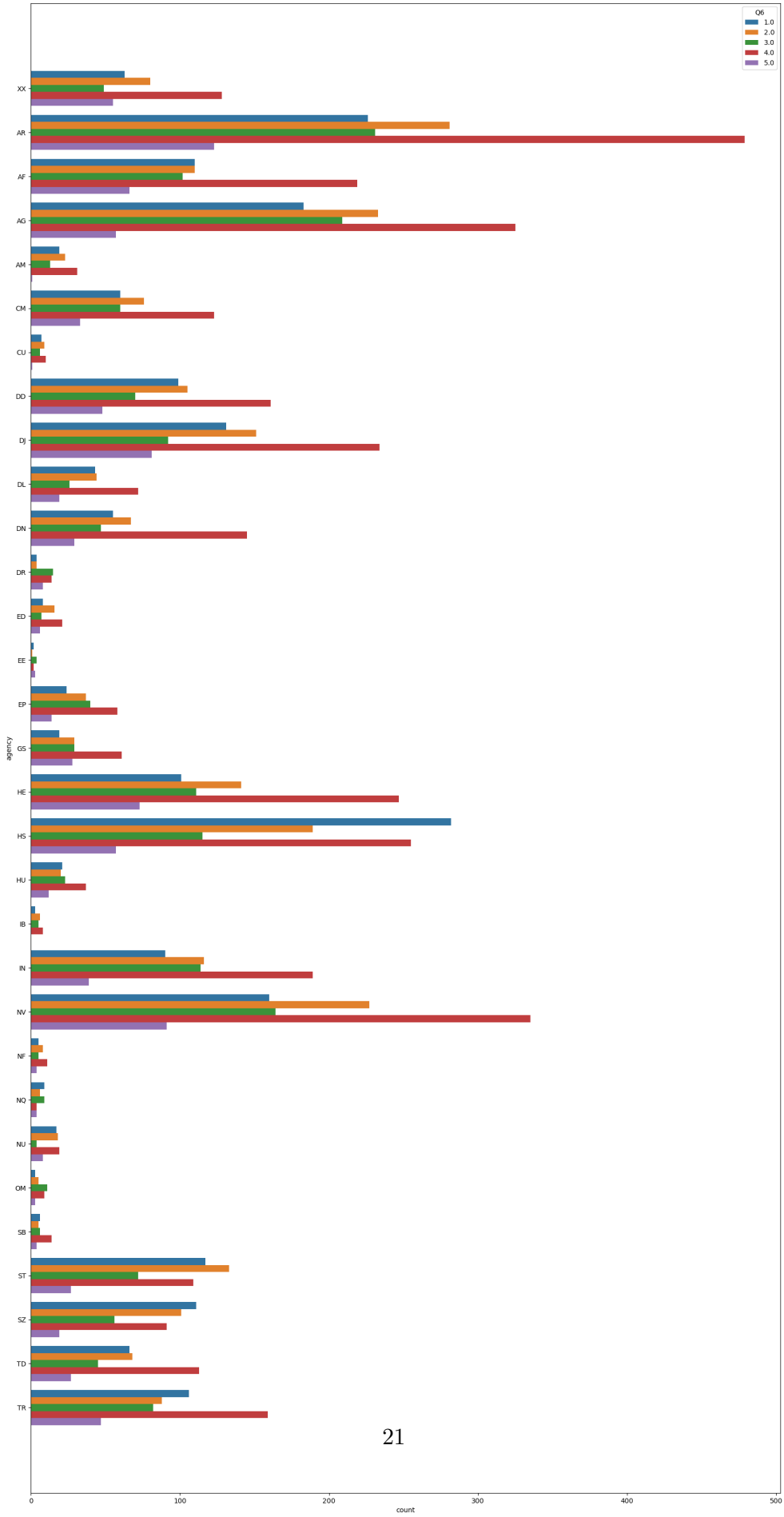
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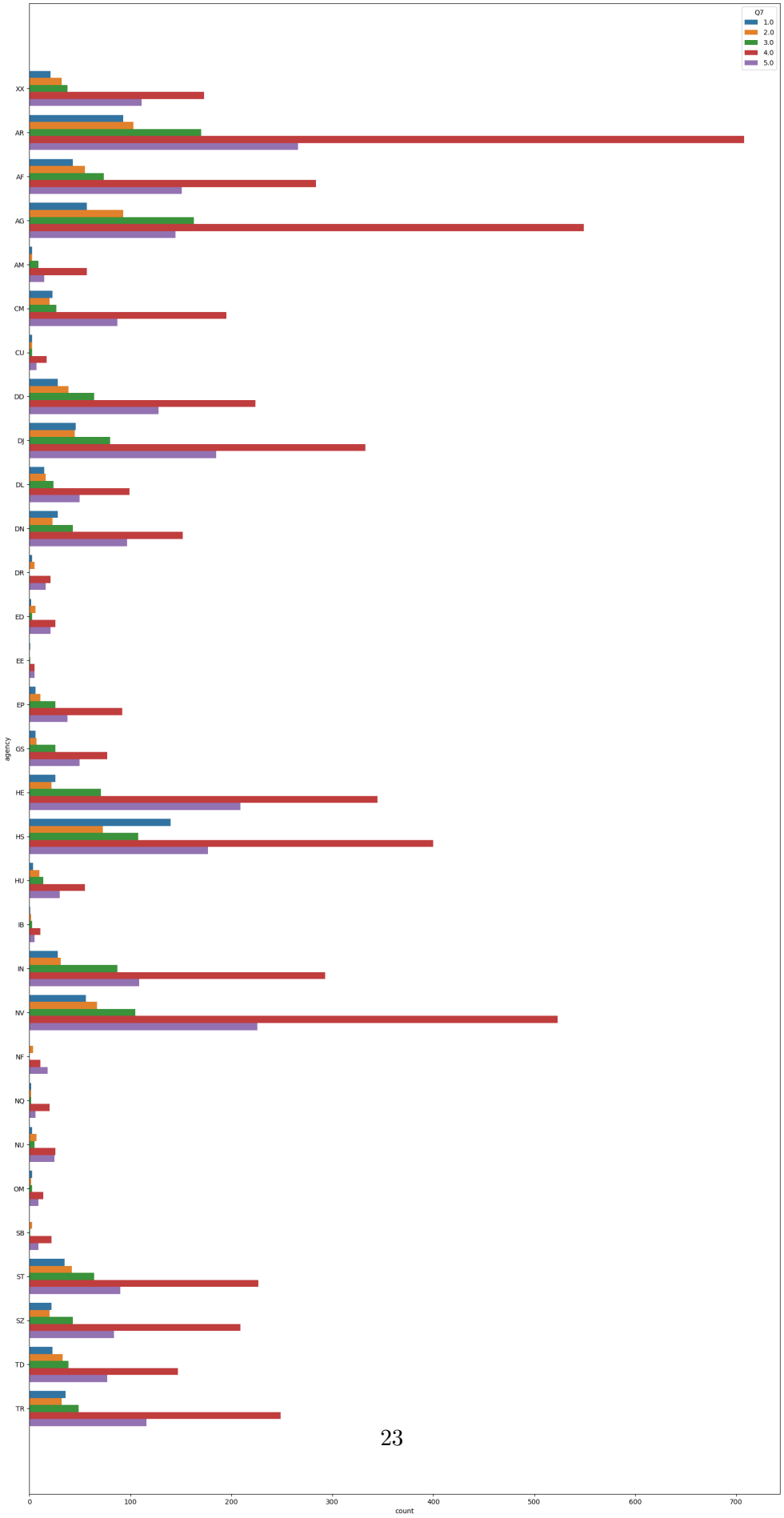
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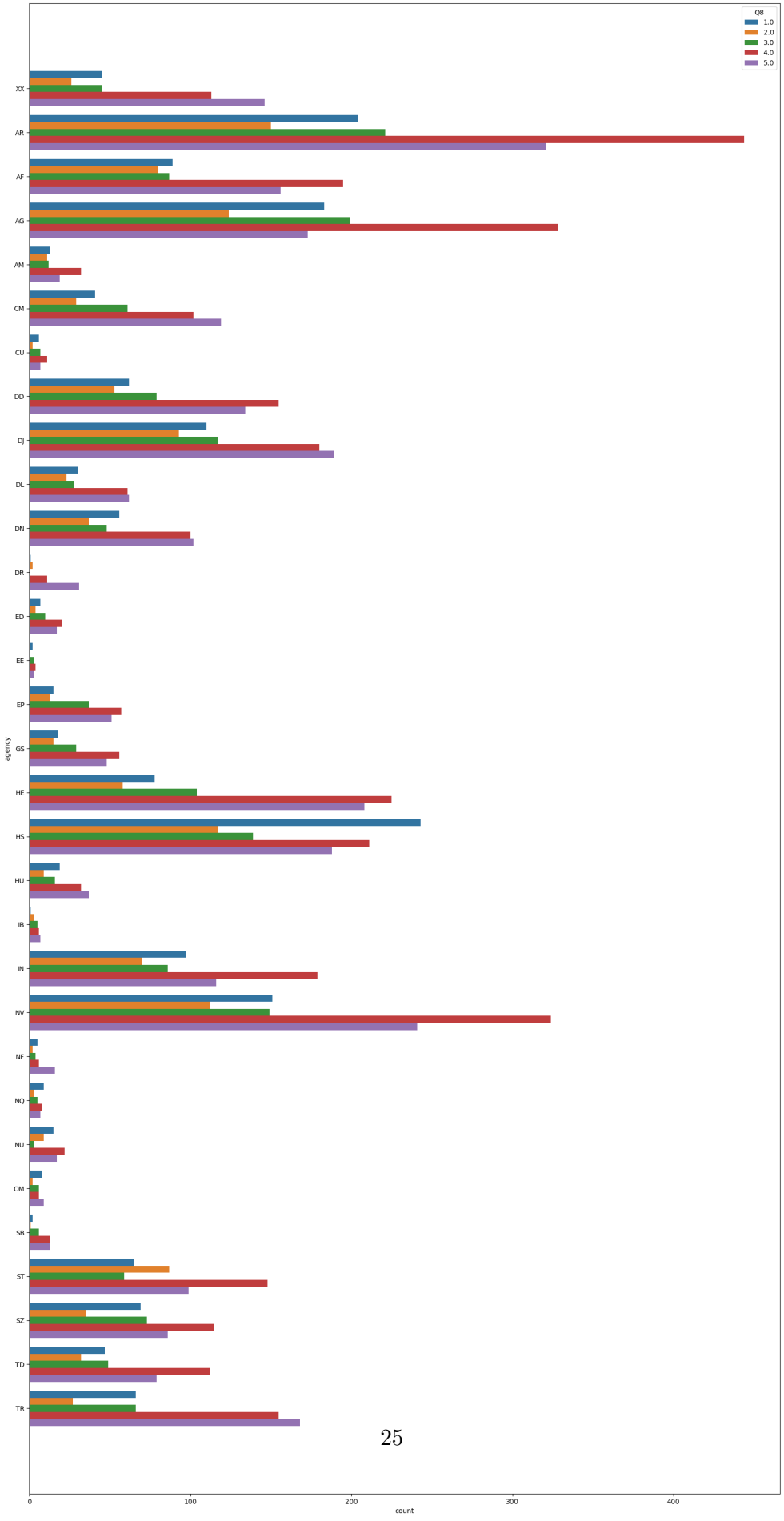
count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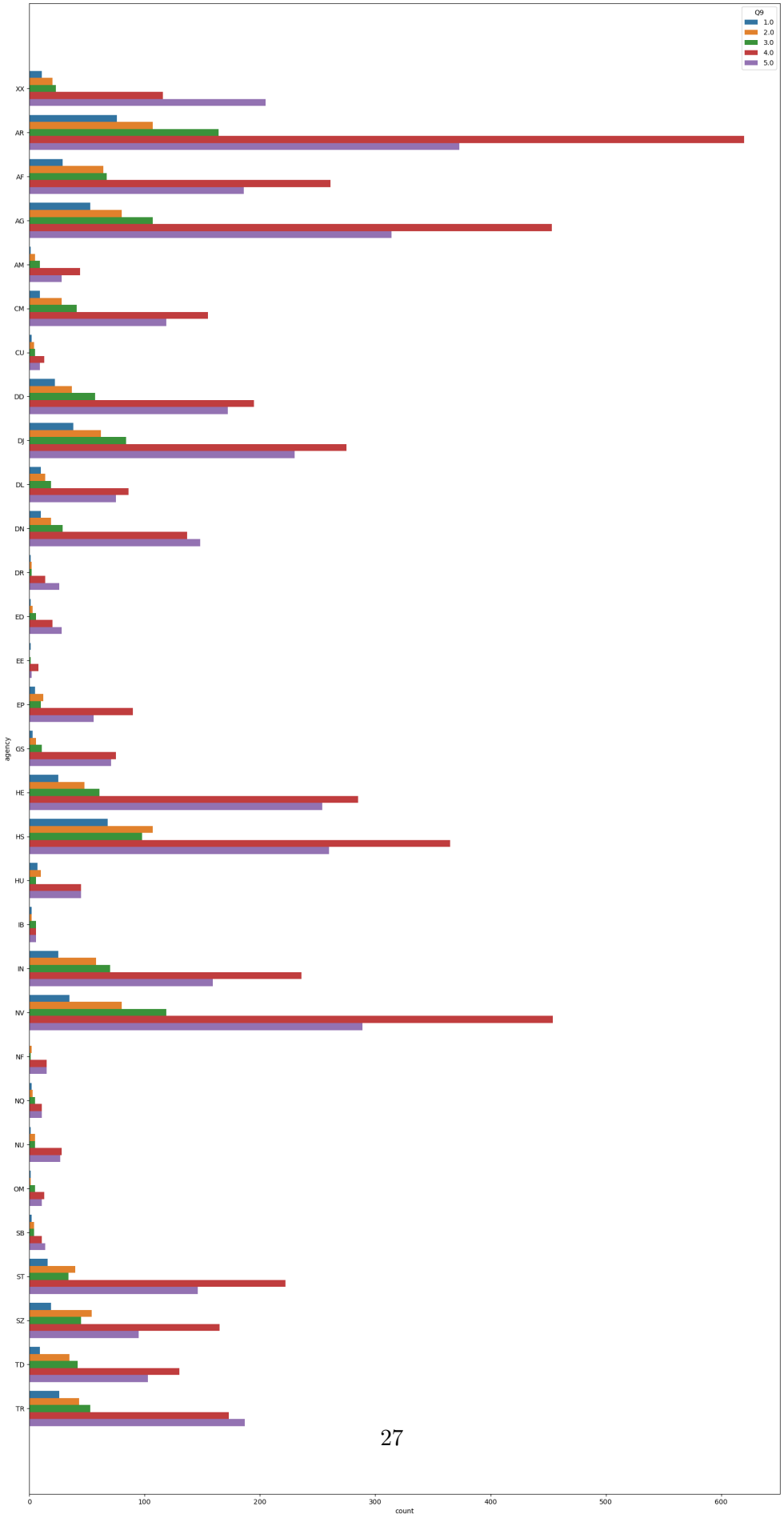
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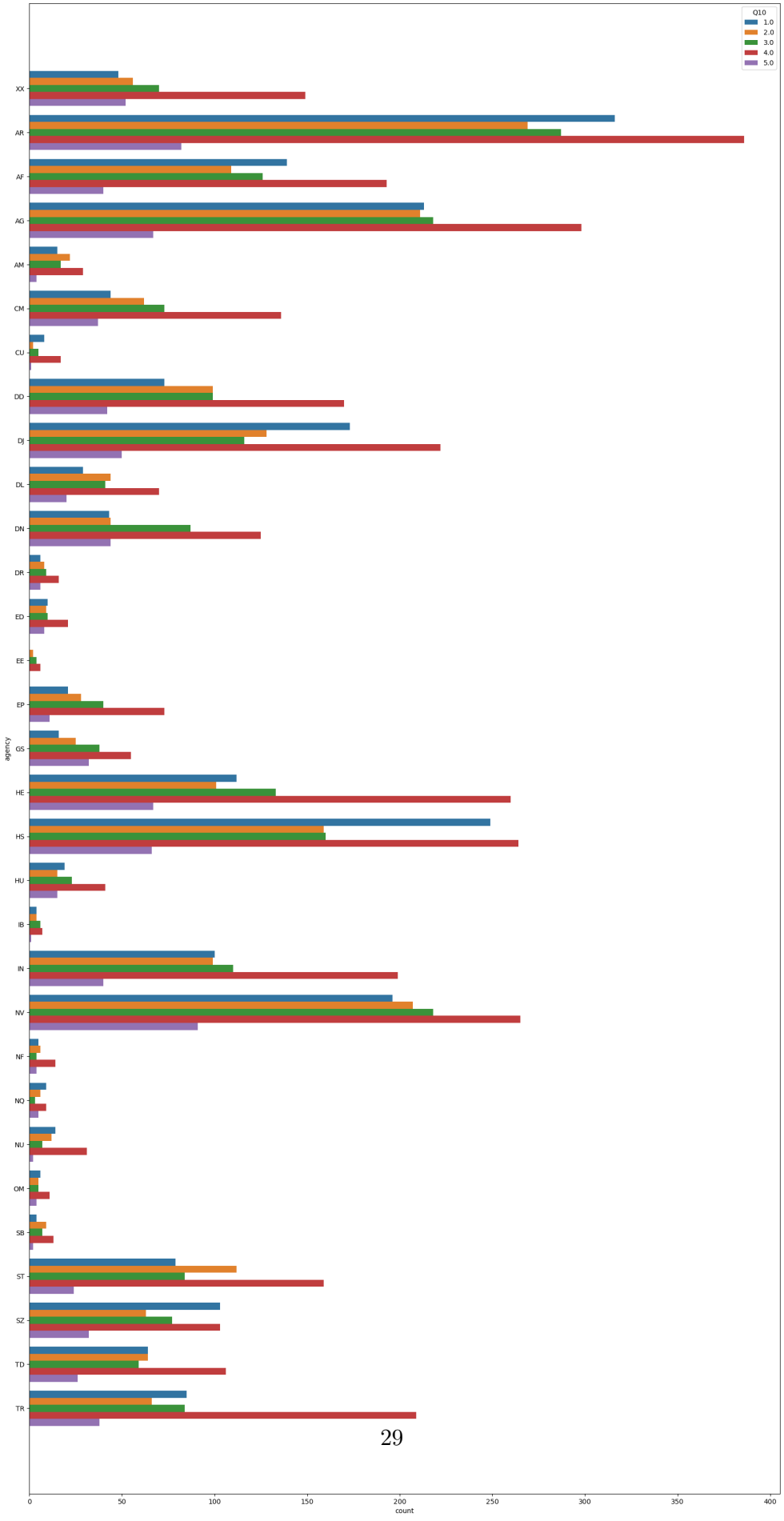
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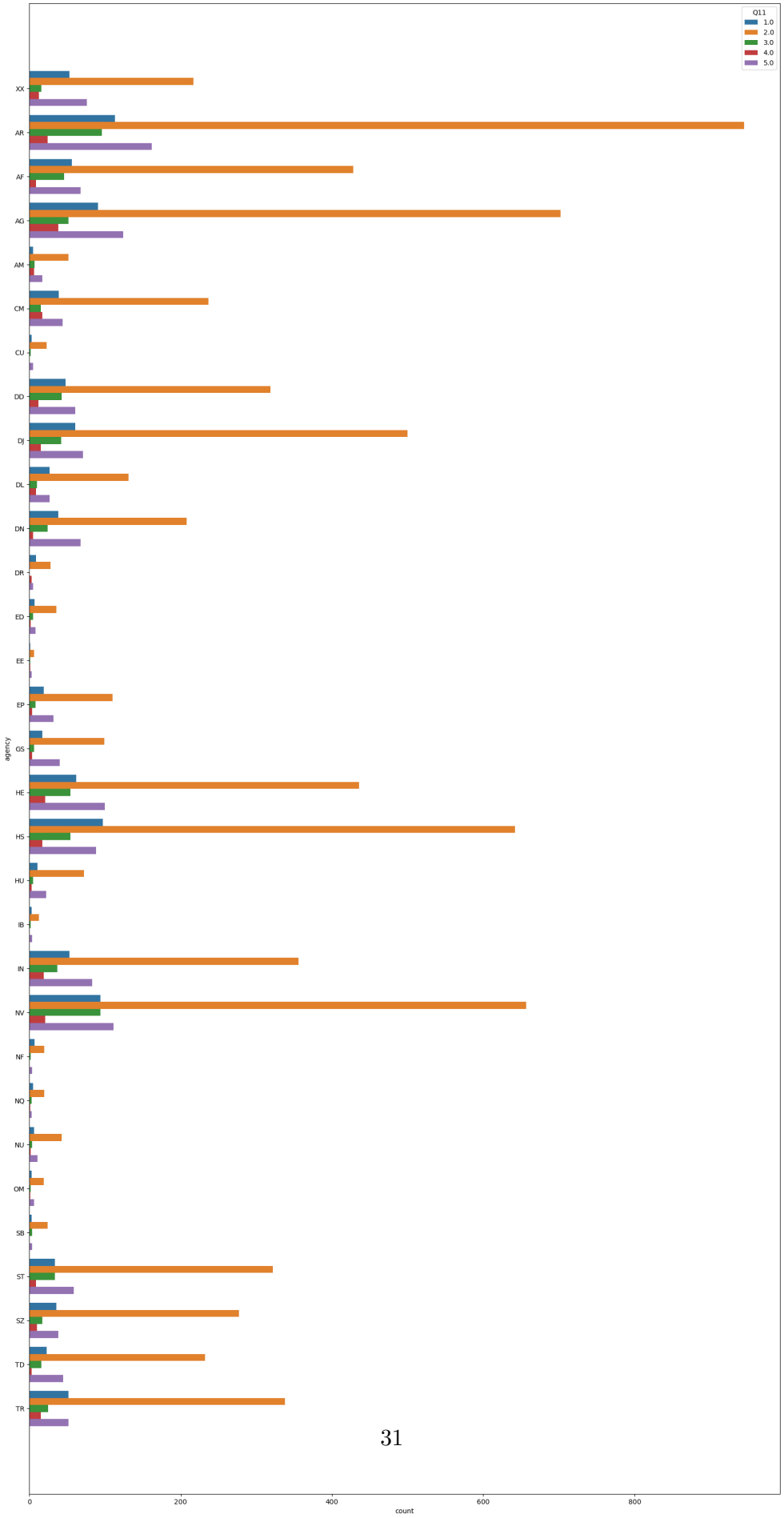
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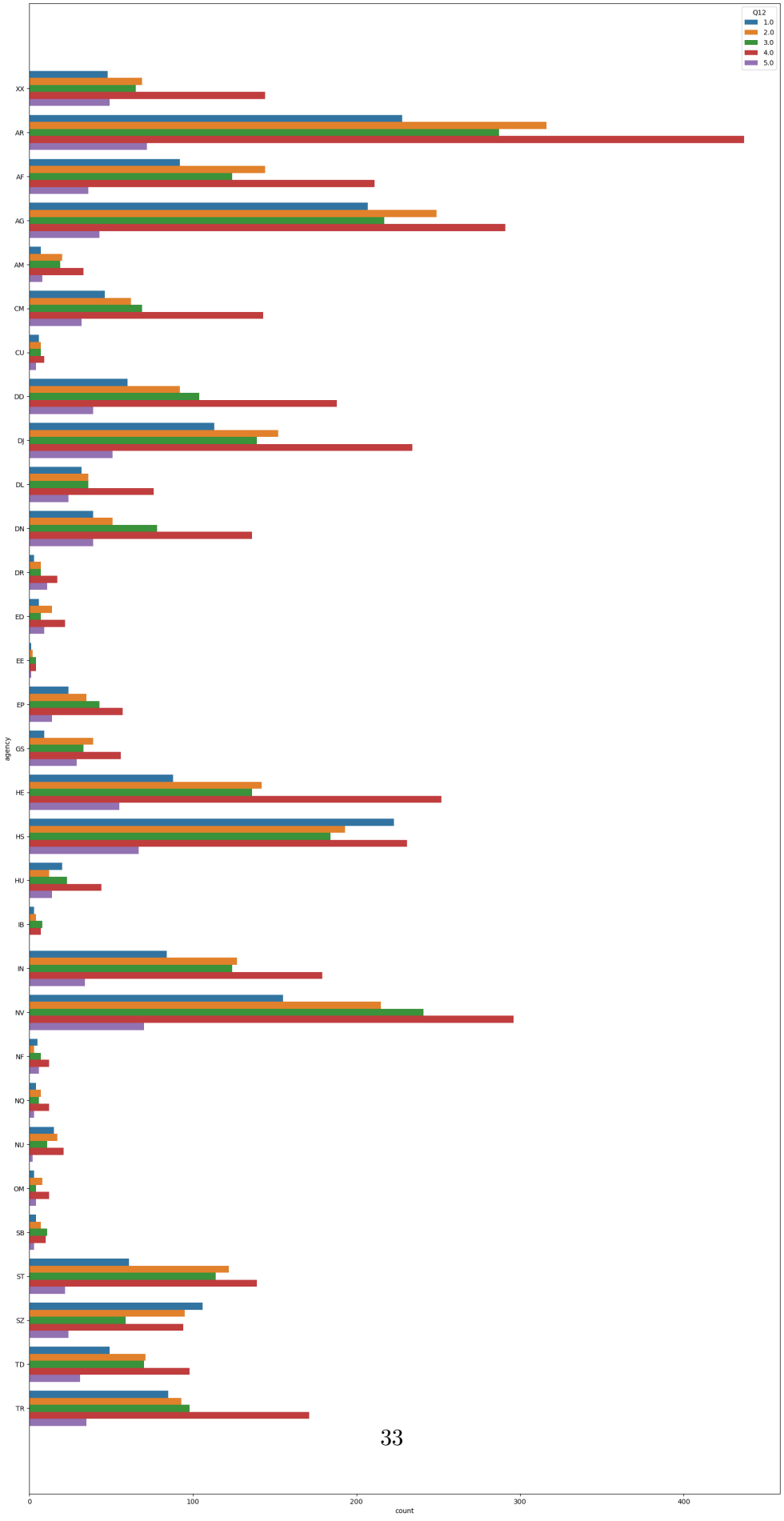
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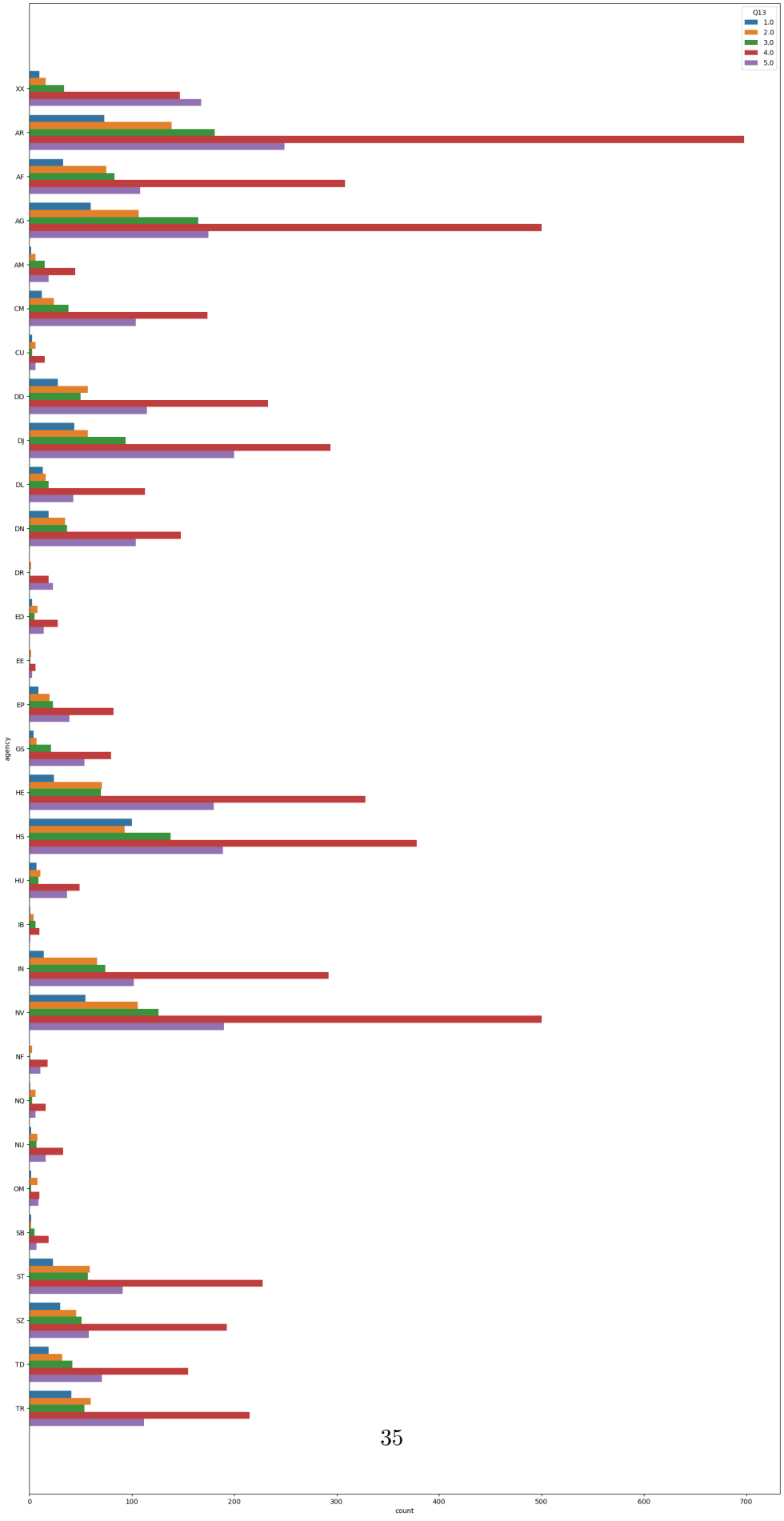
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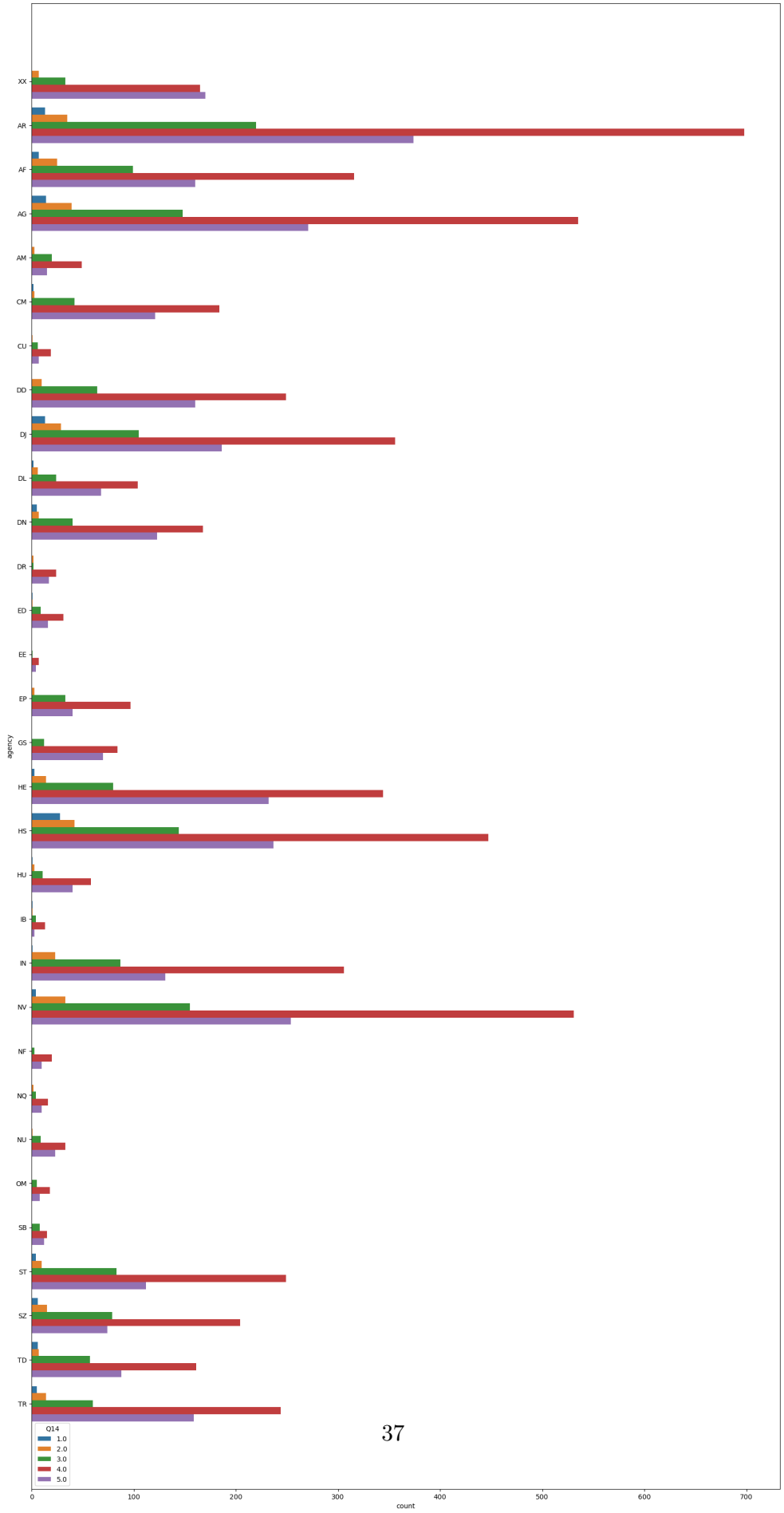
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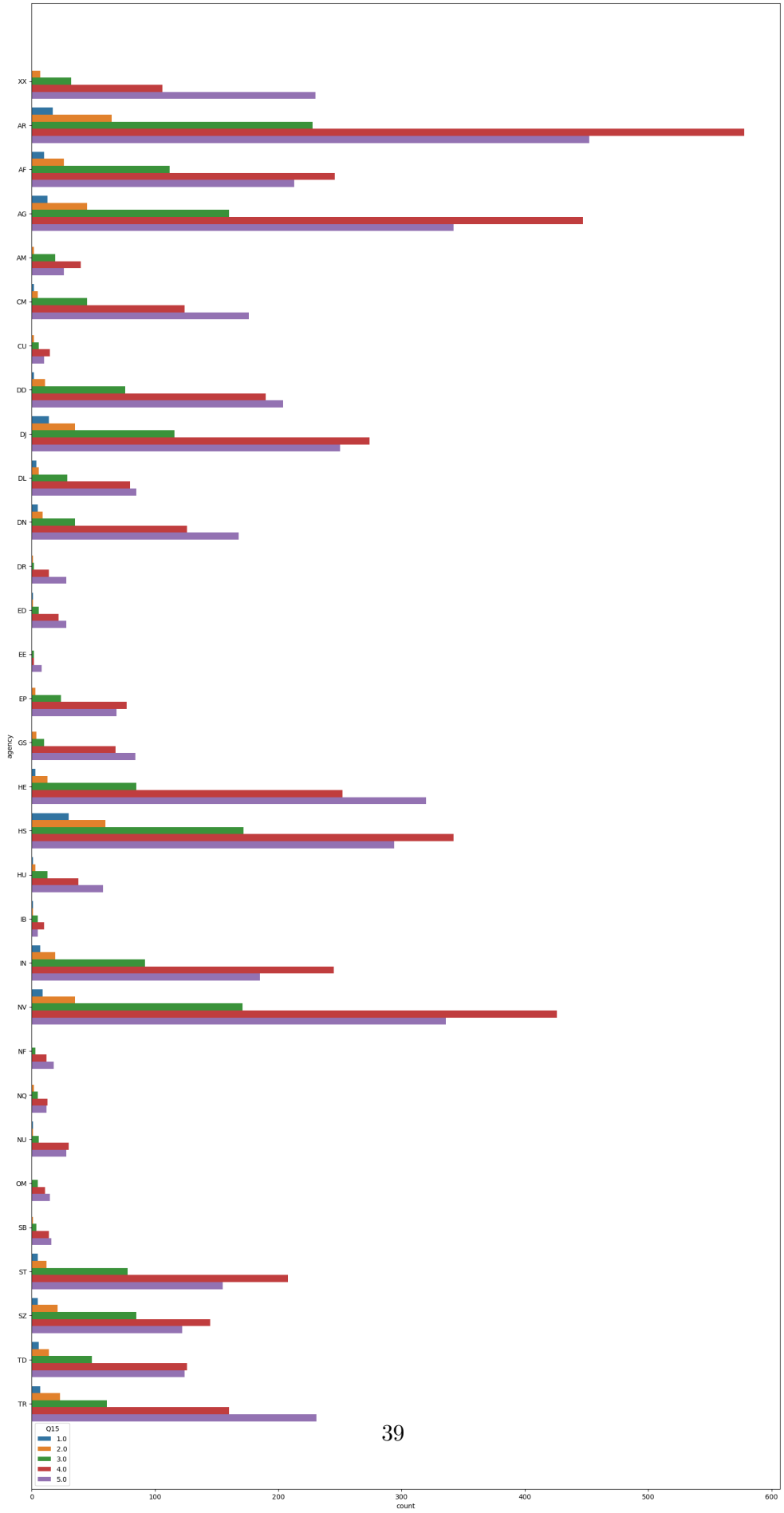
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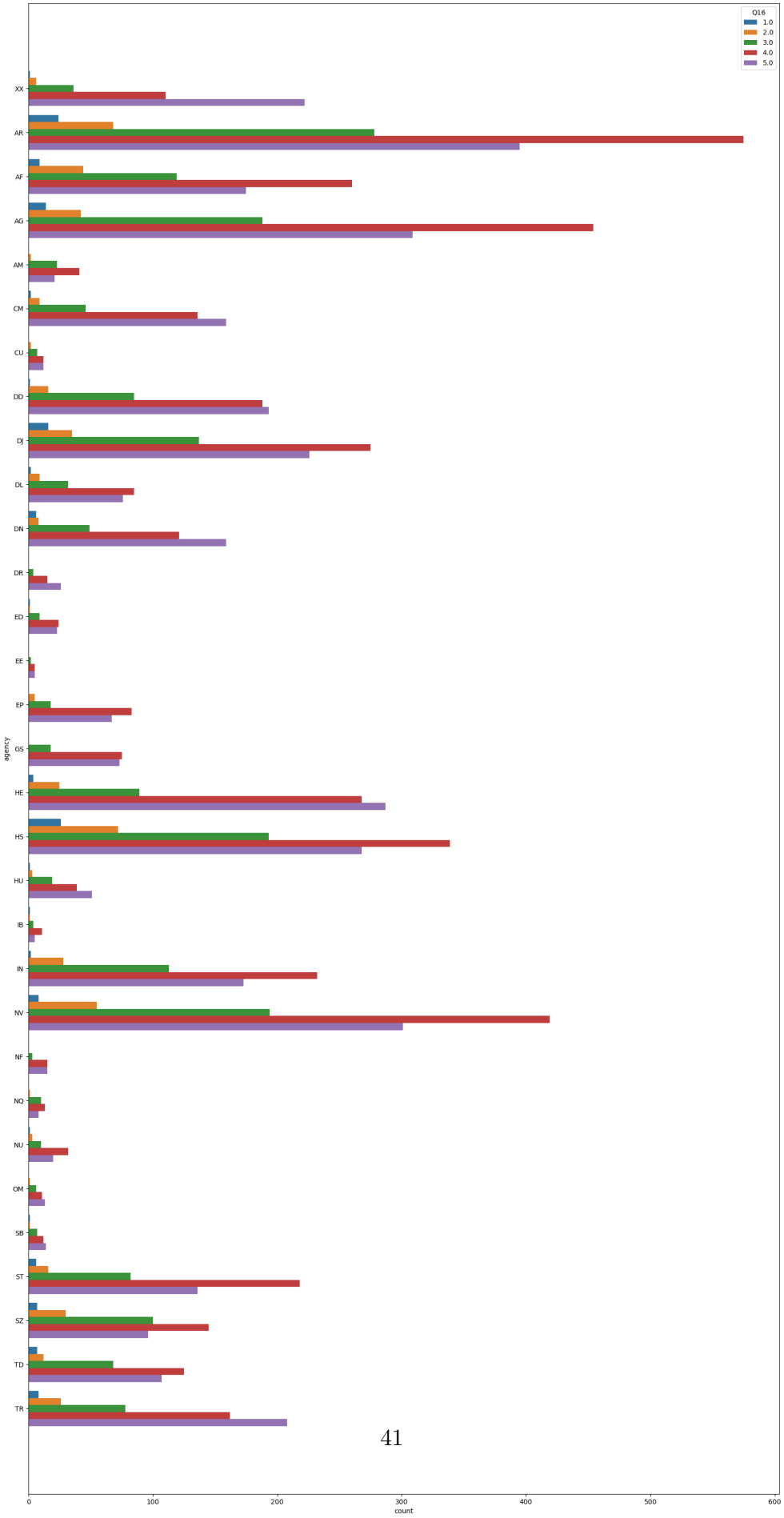
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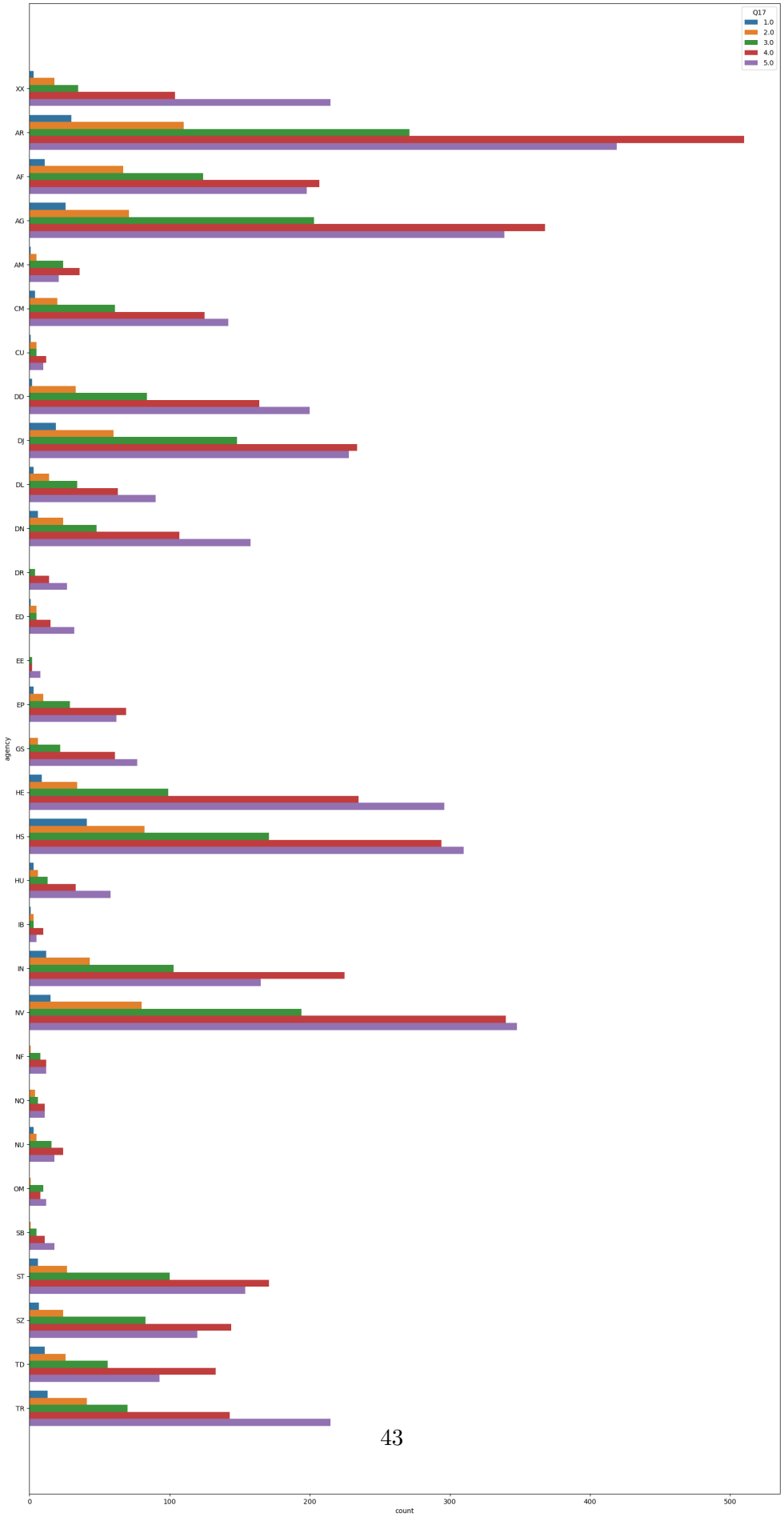
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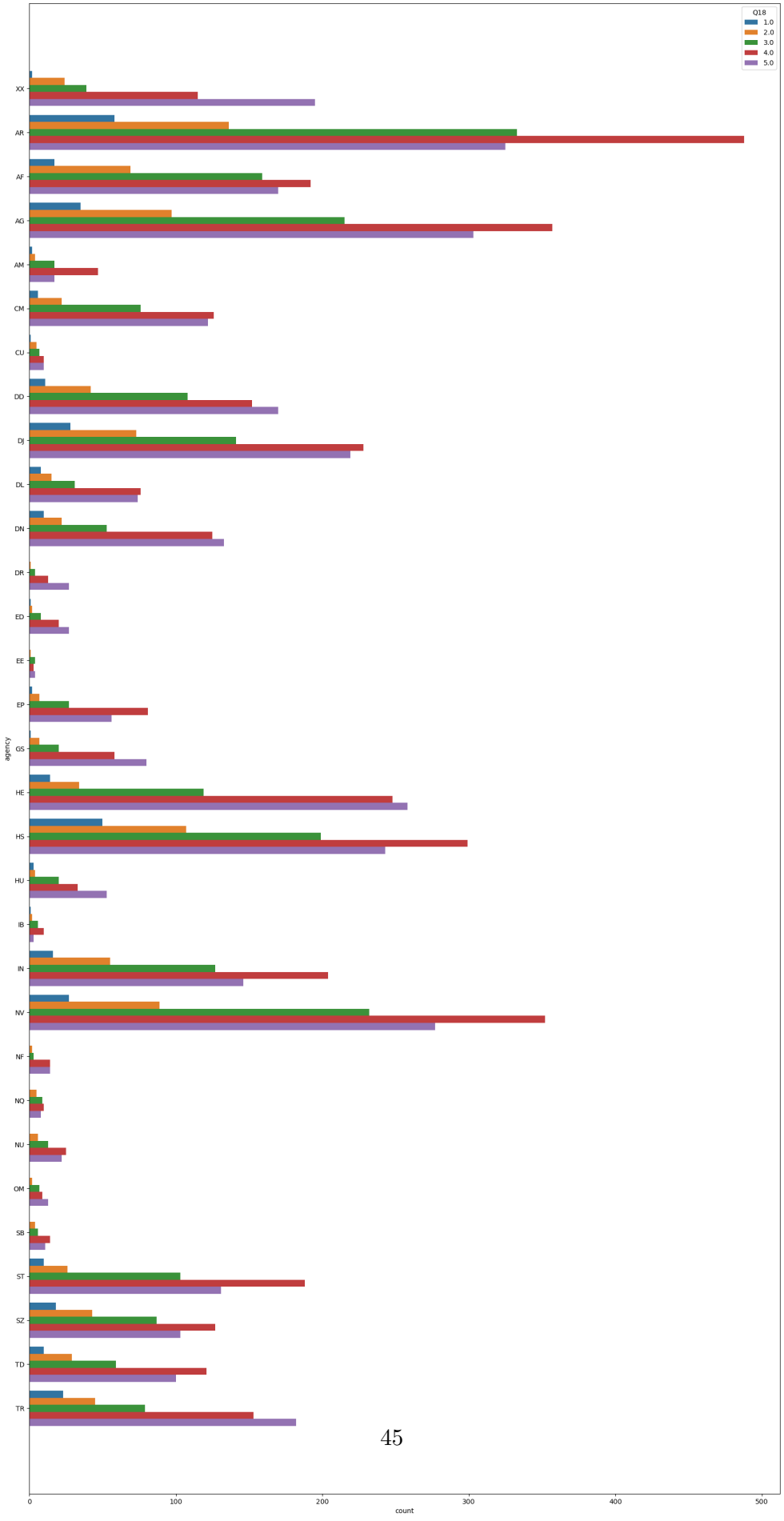
count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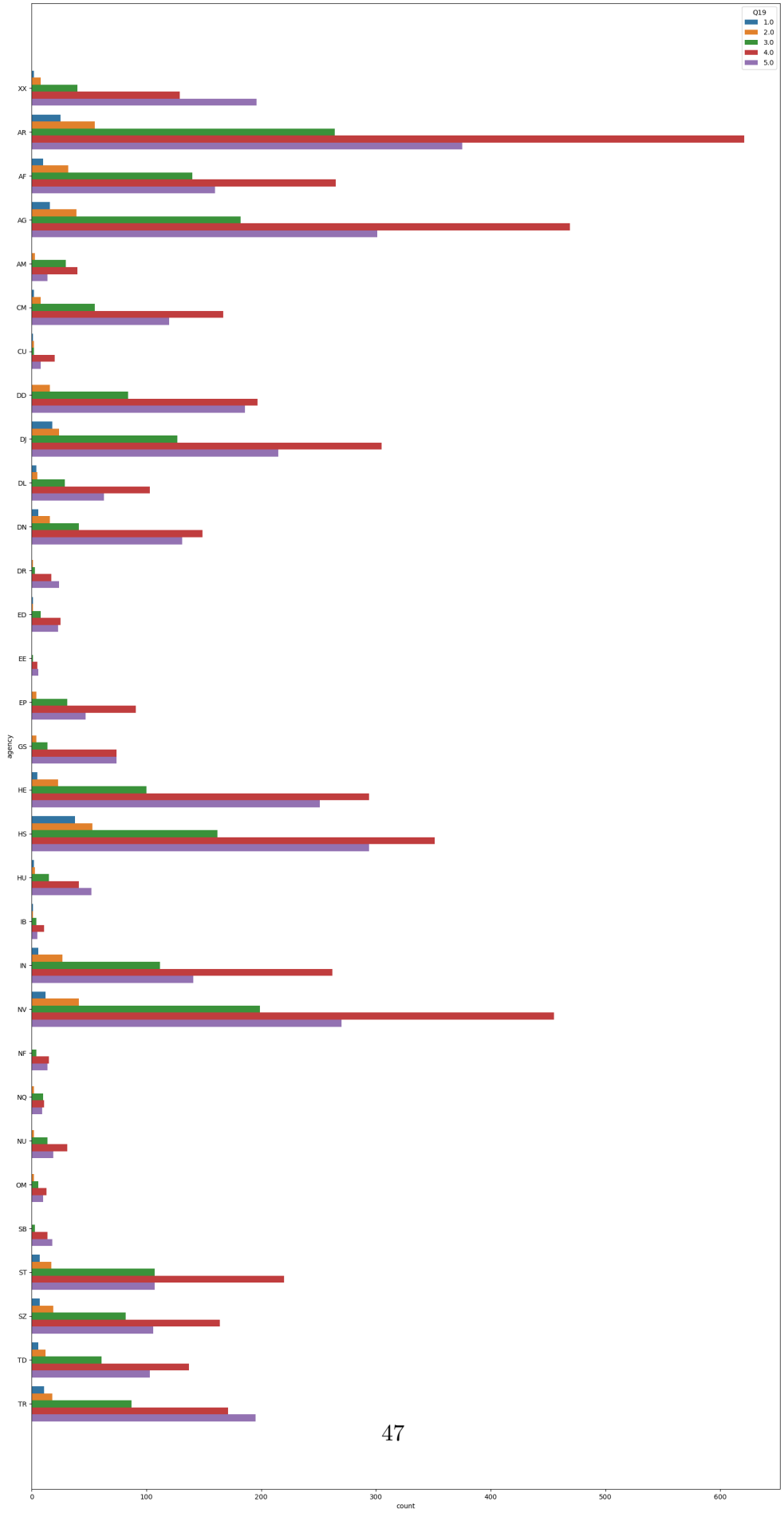
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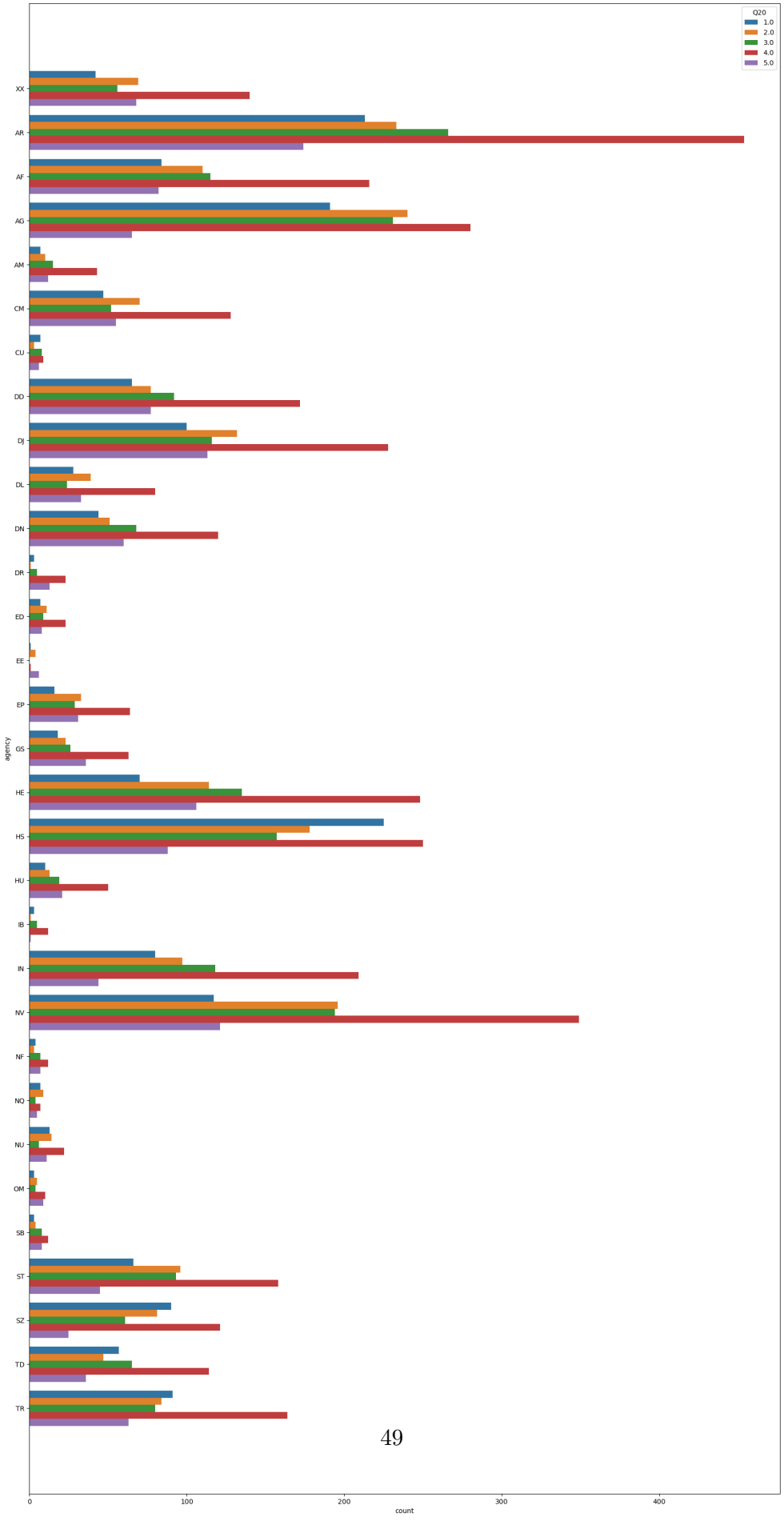
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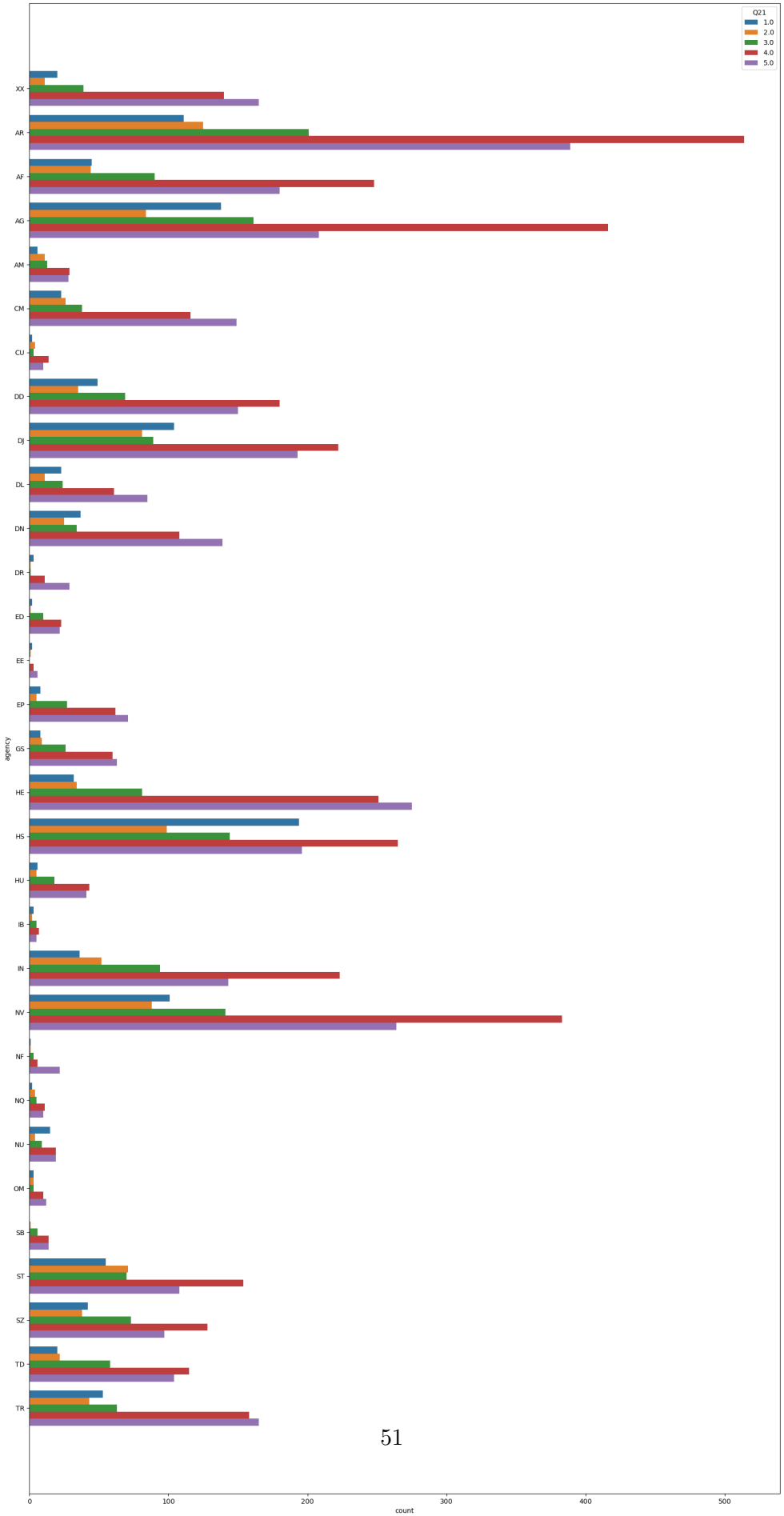
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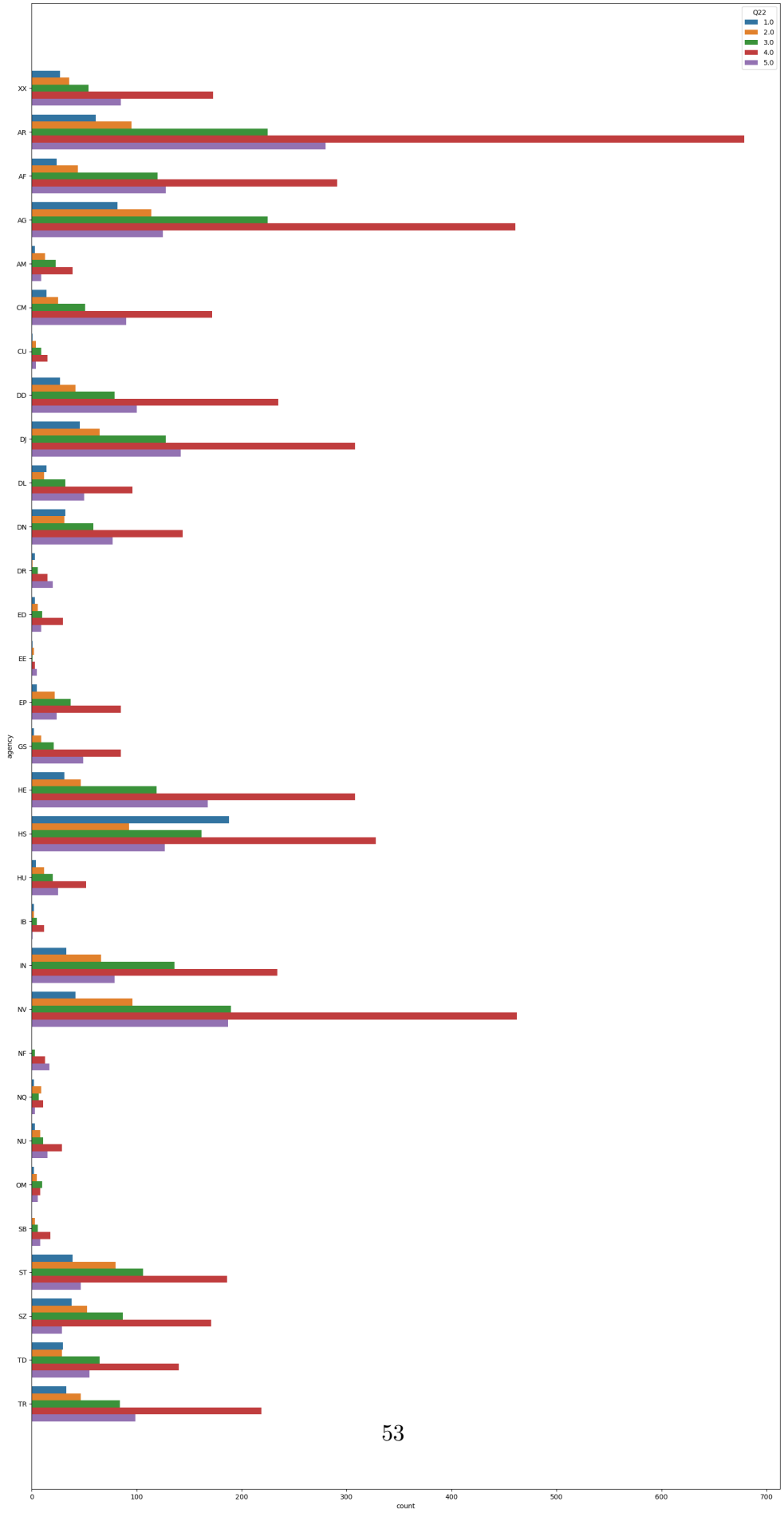
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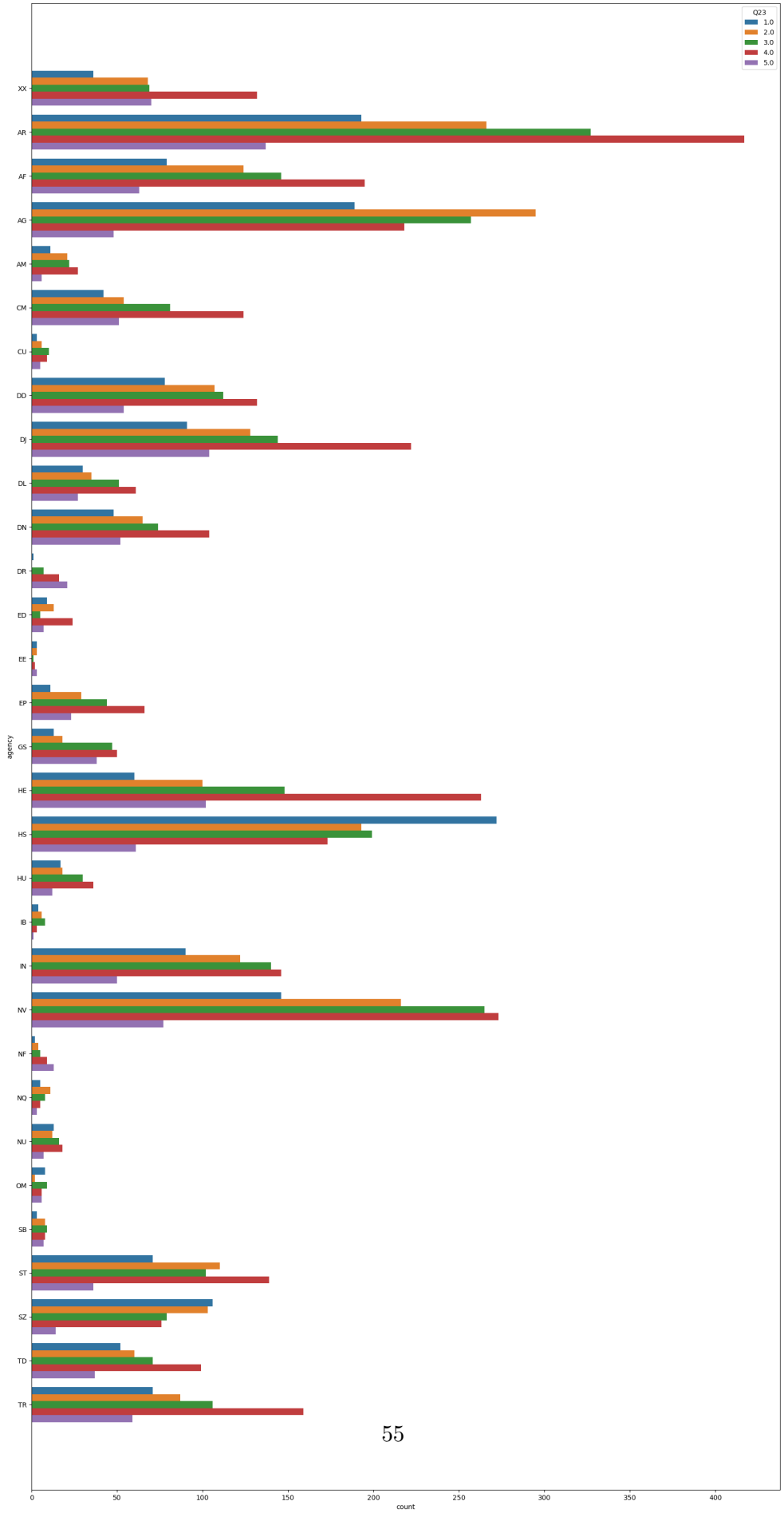
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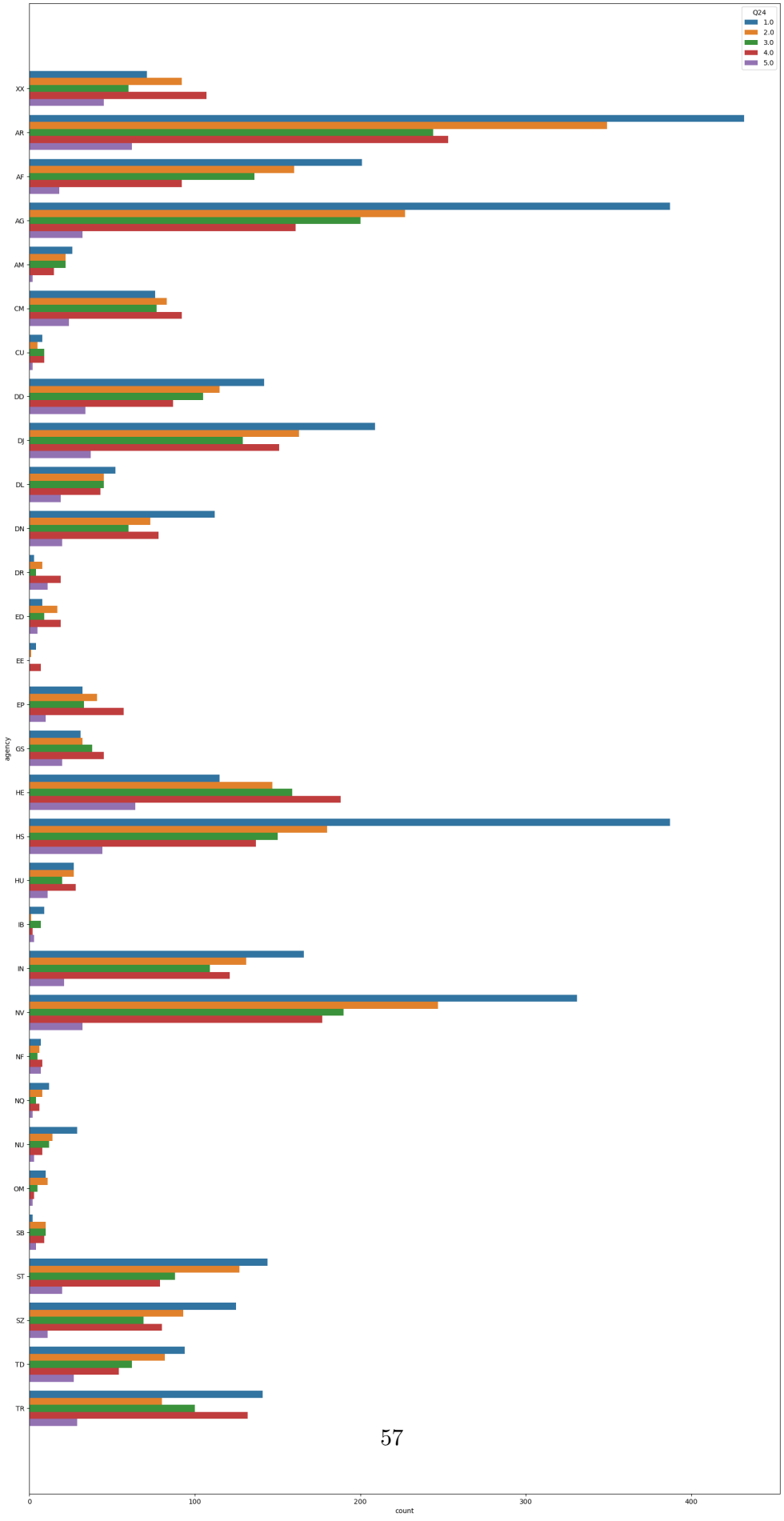
Q24
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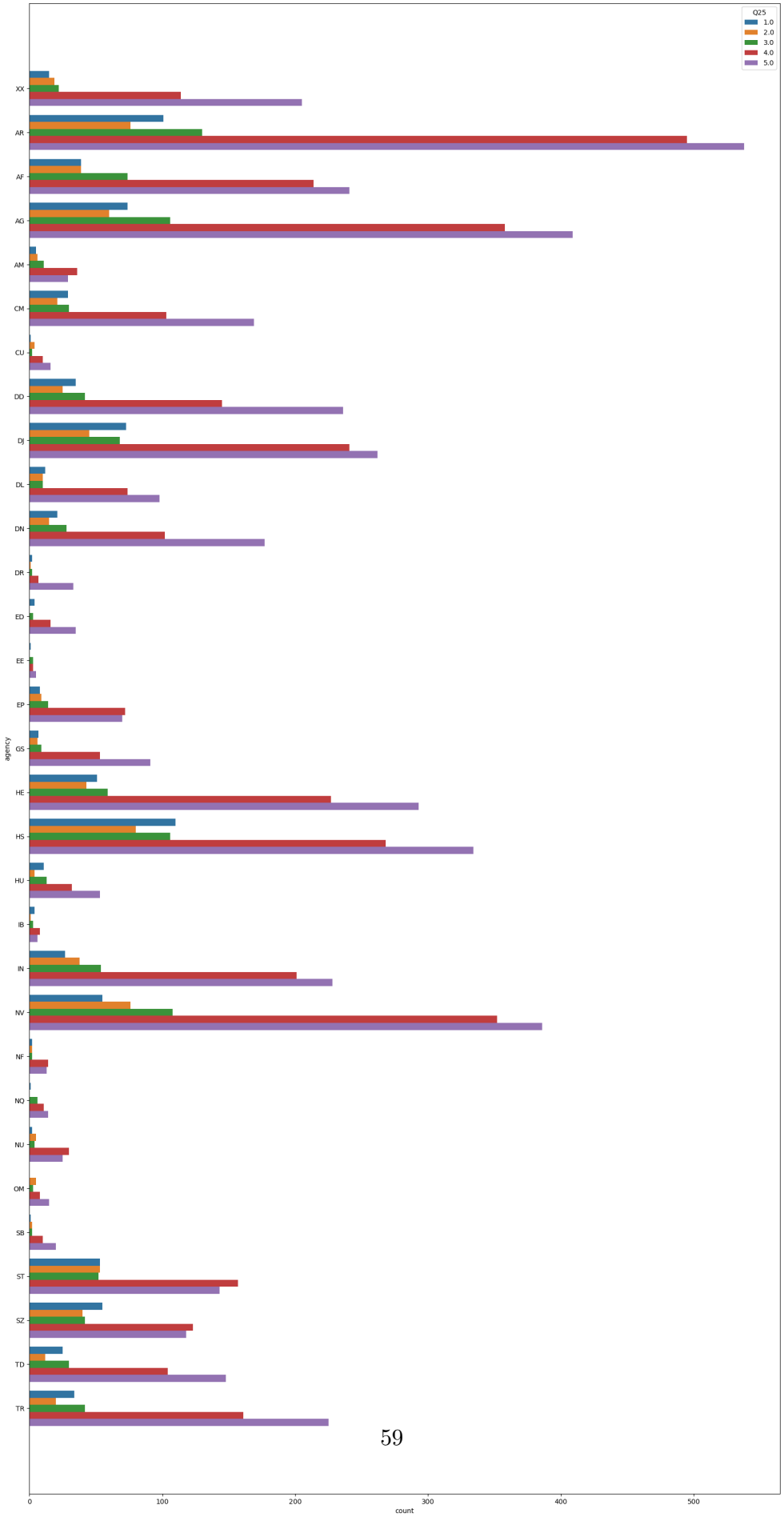
Q25
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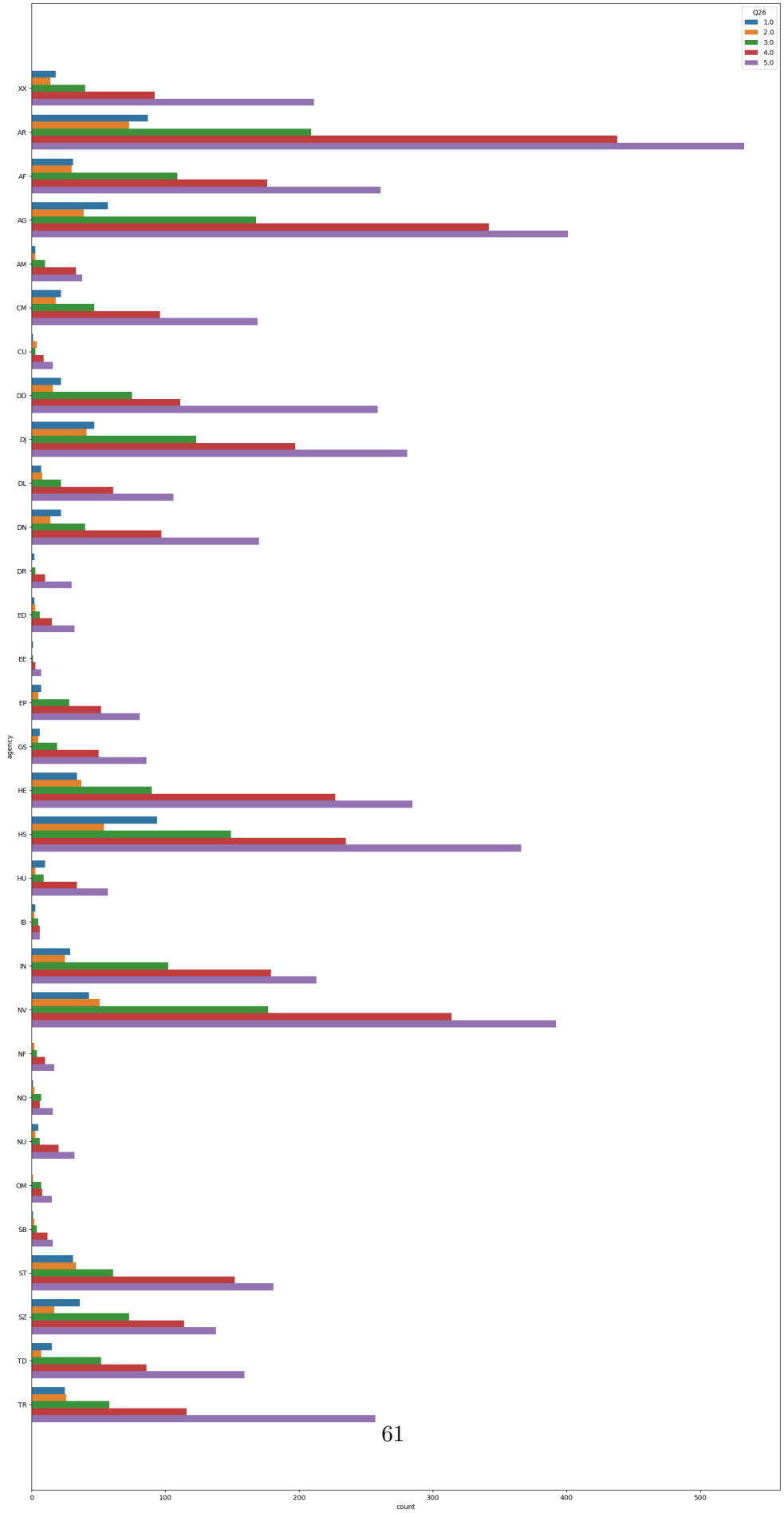
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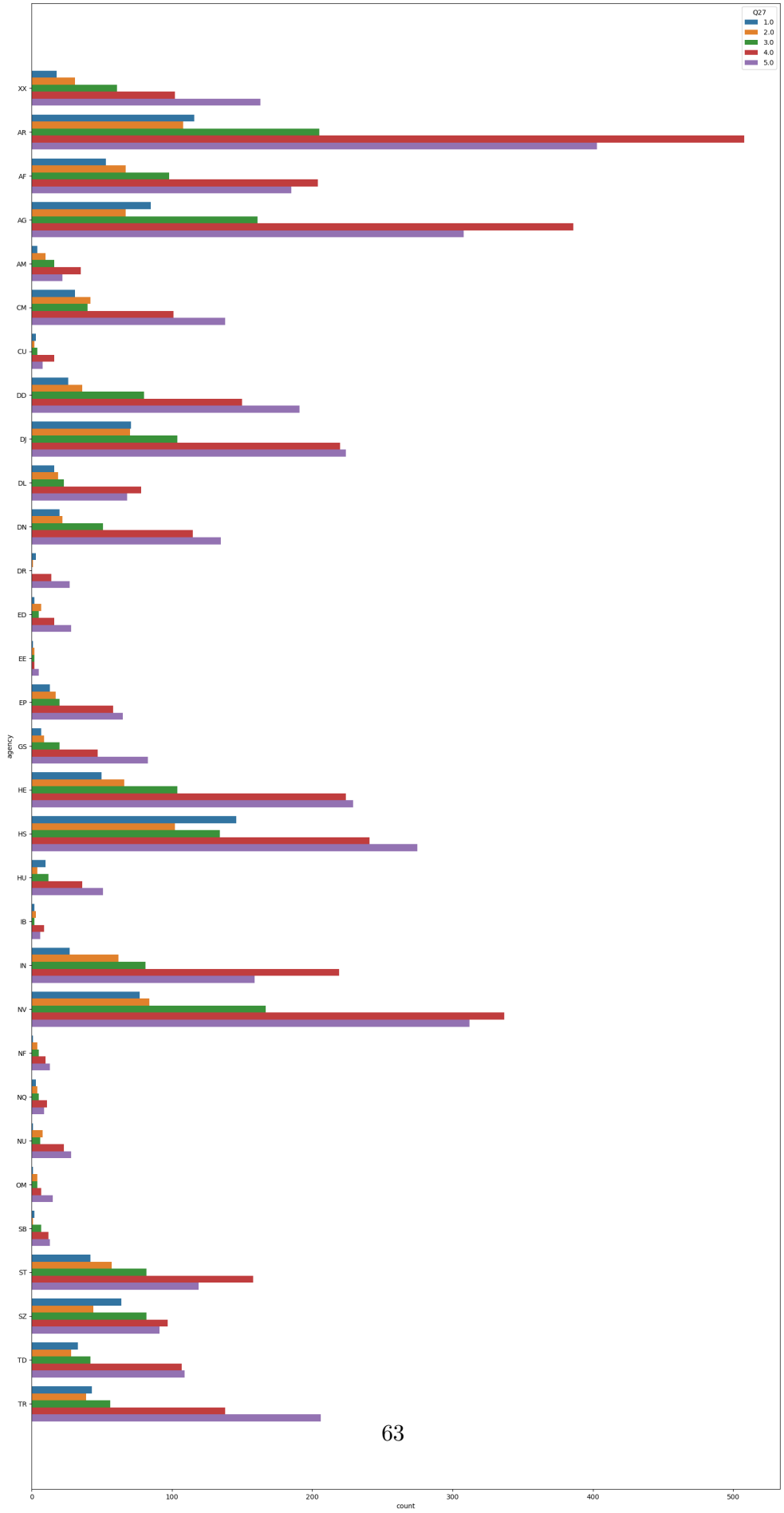
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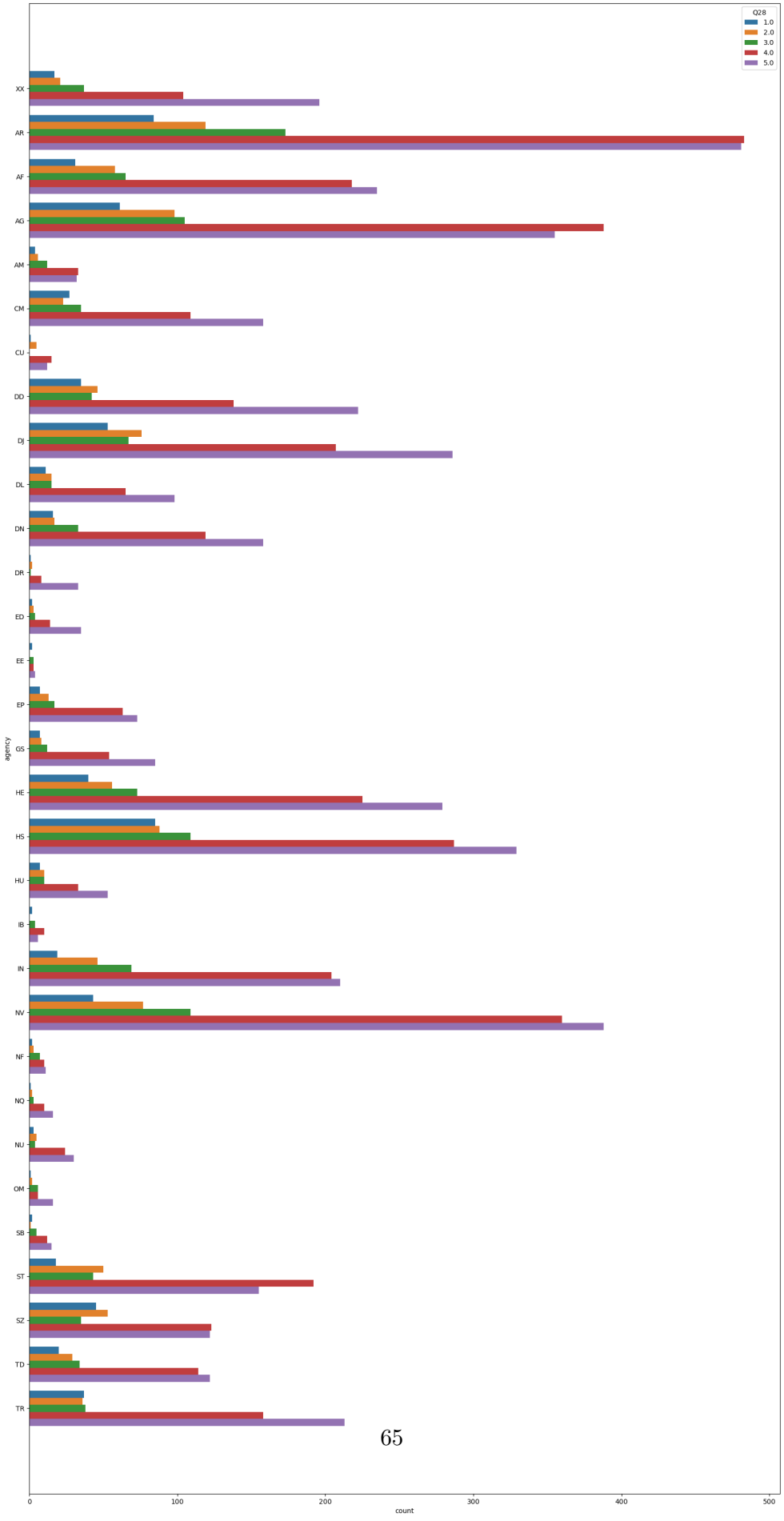
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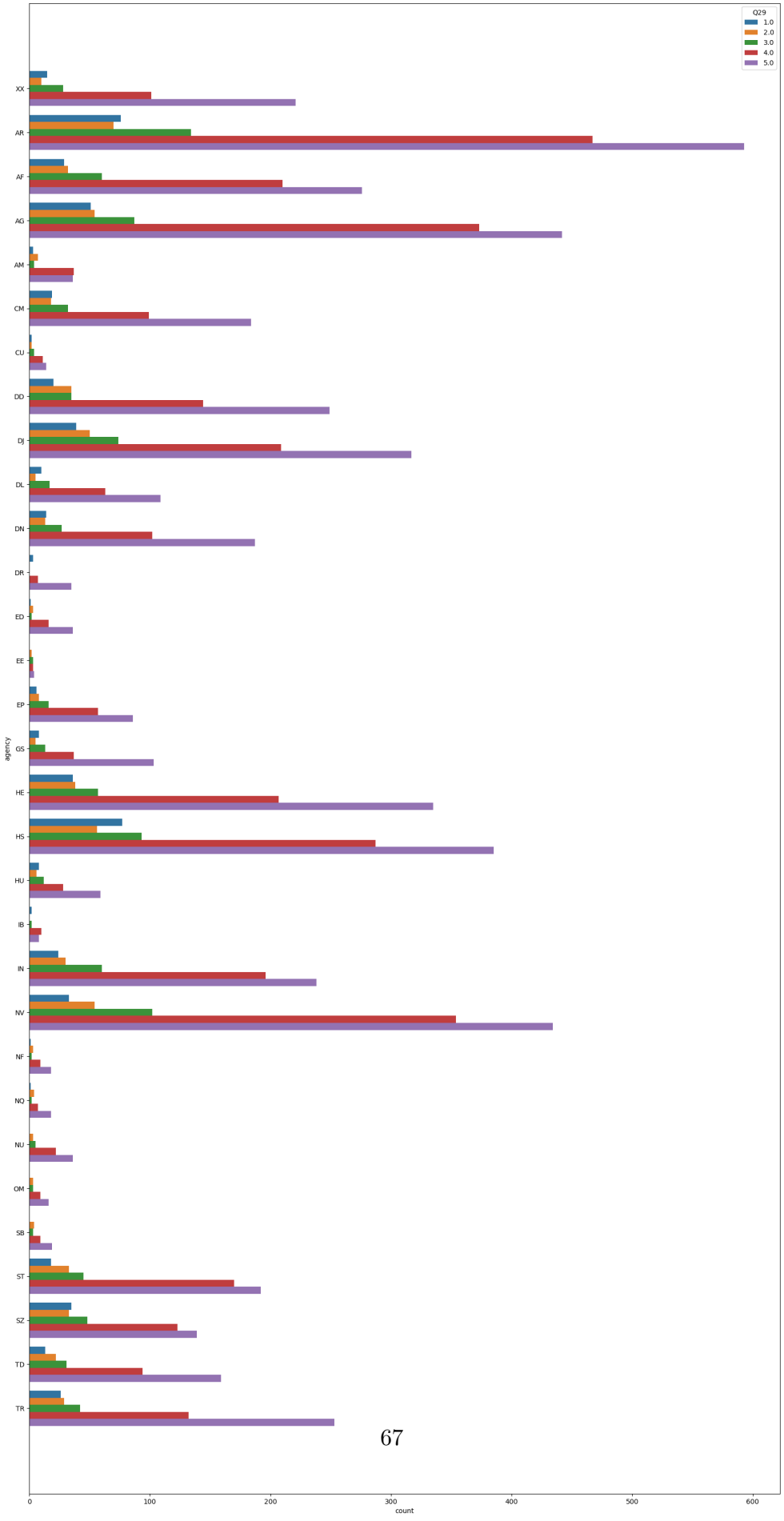
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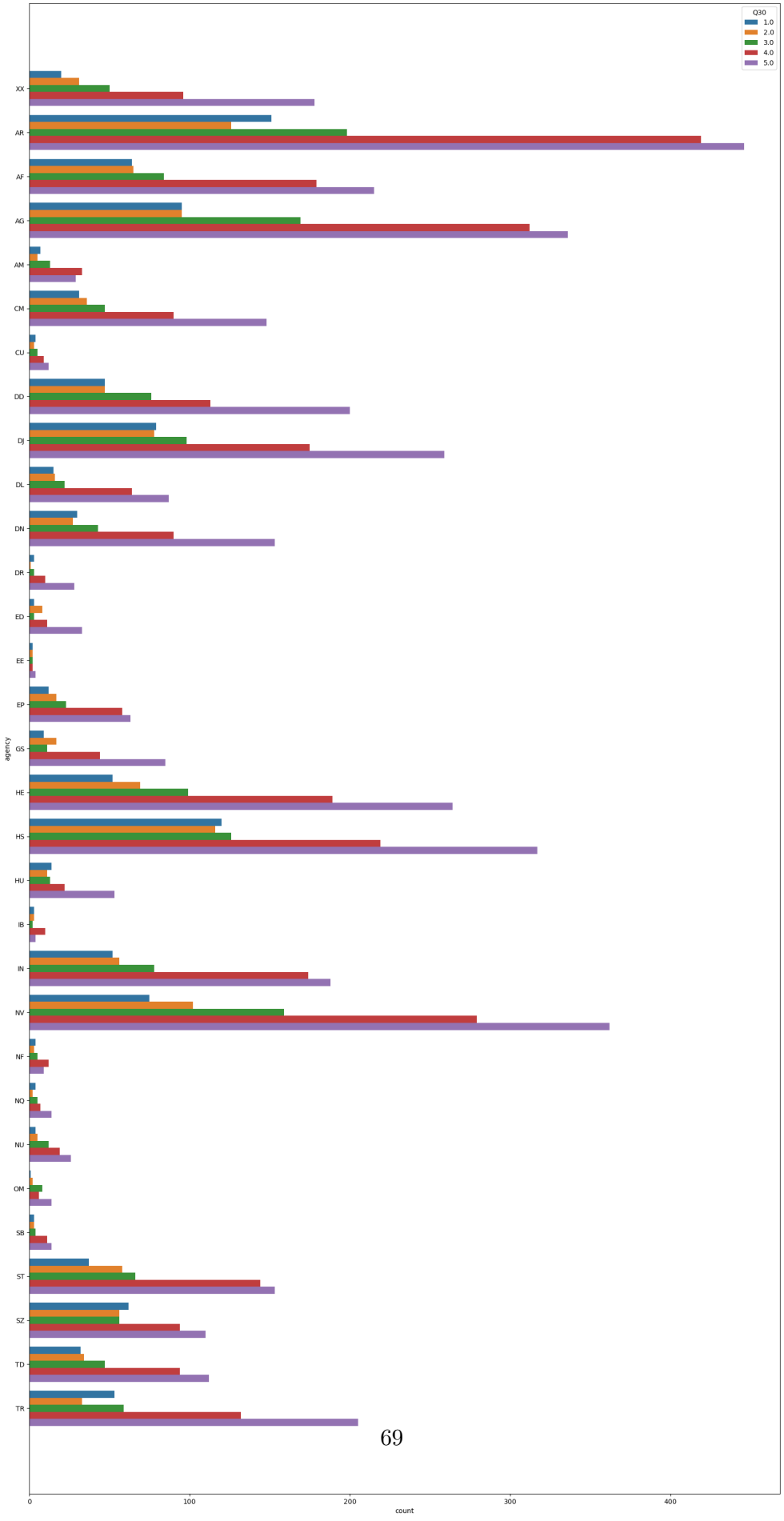
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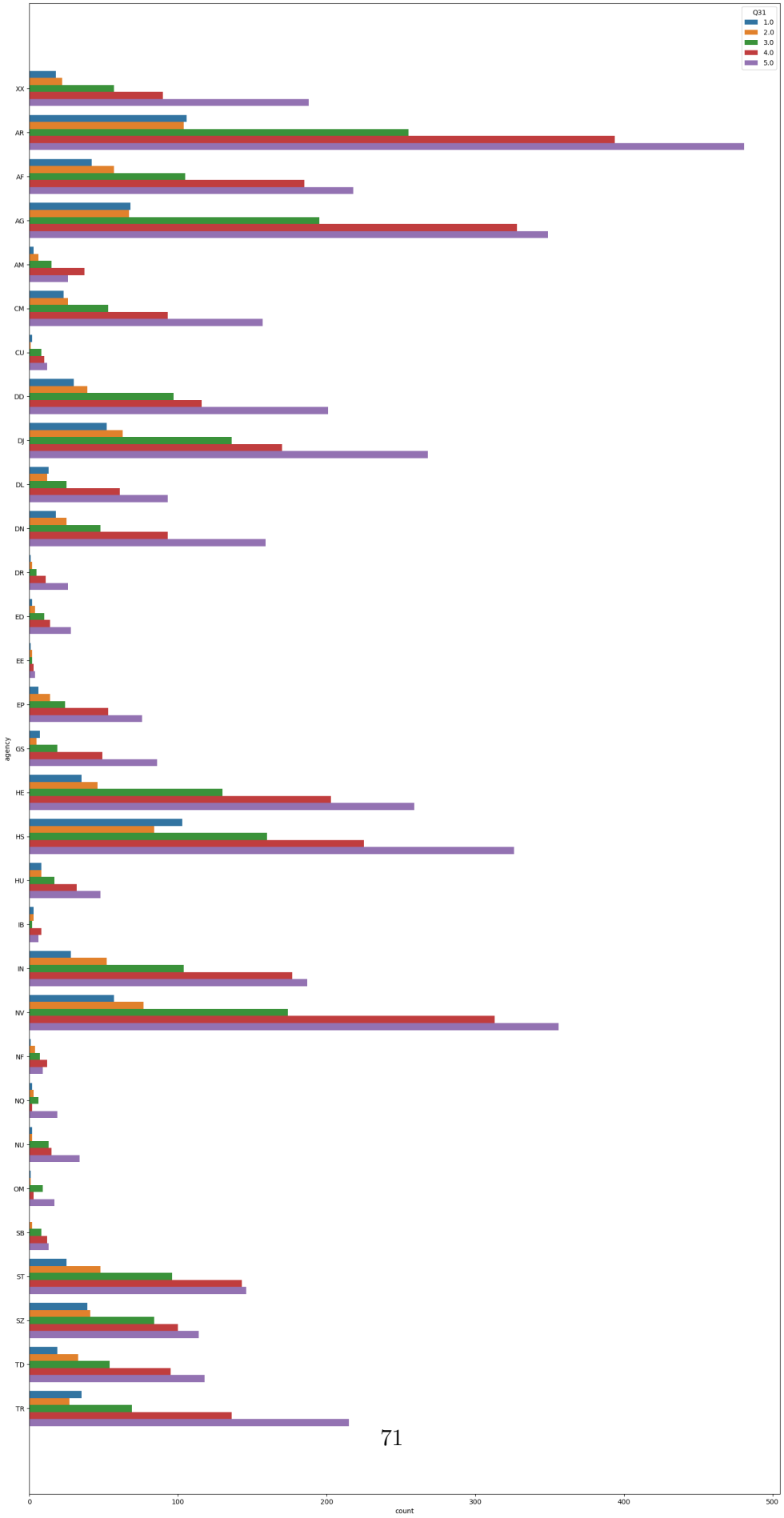
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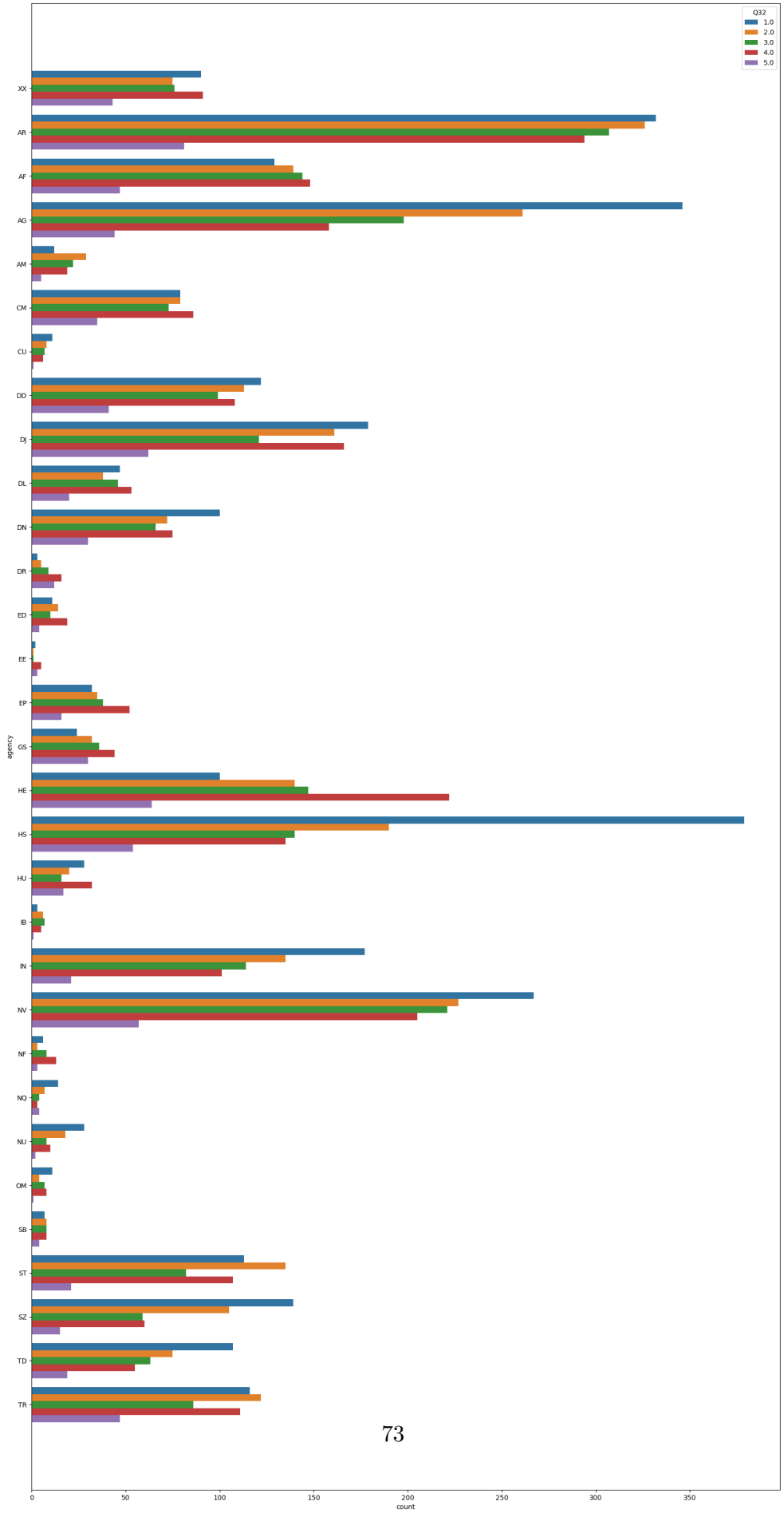
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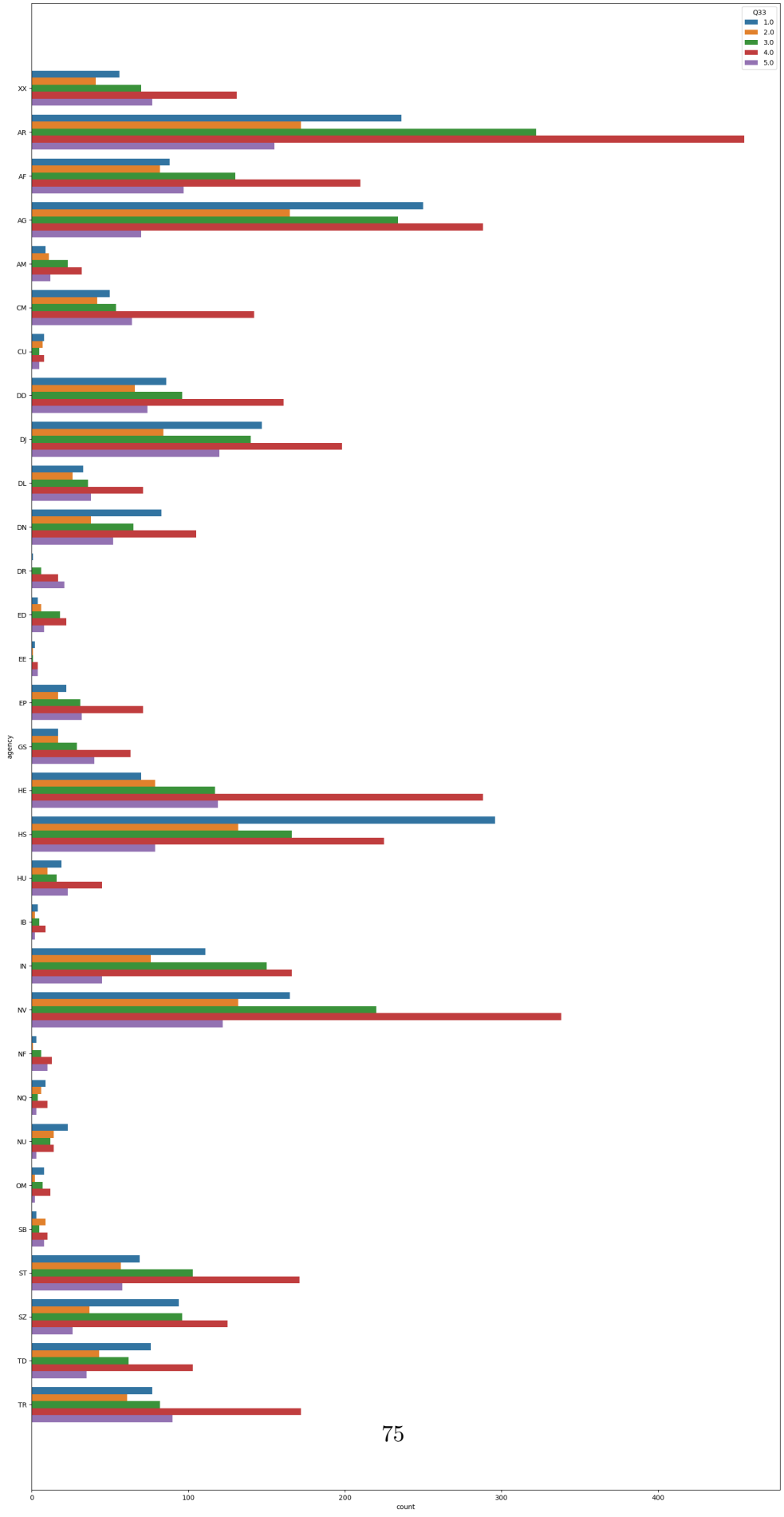
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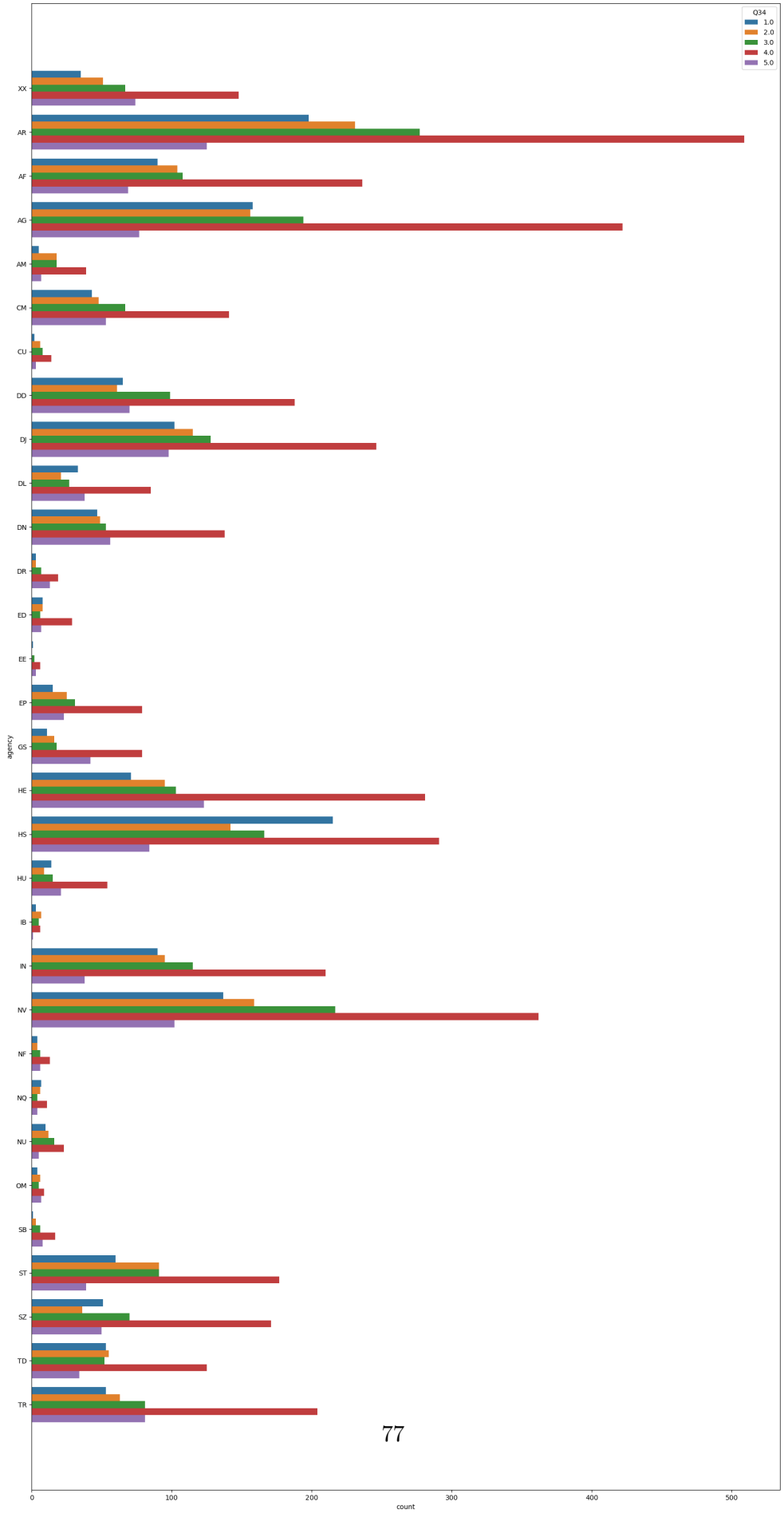
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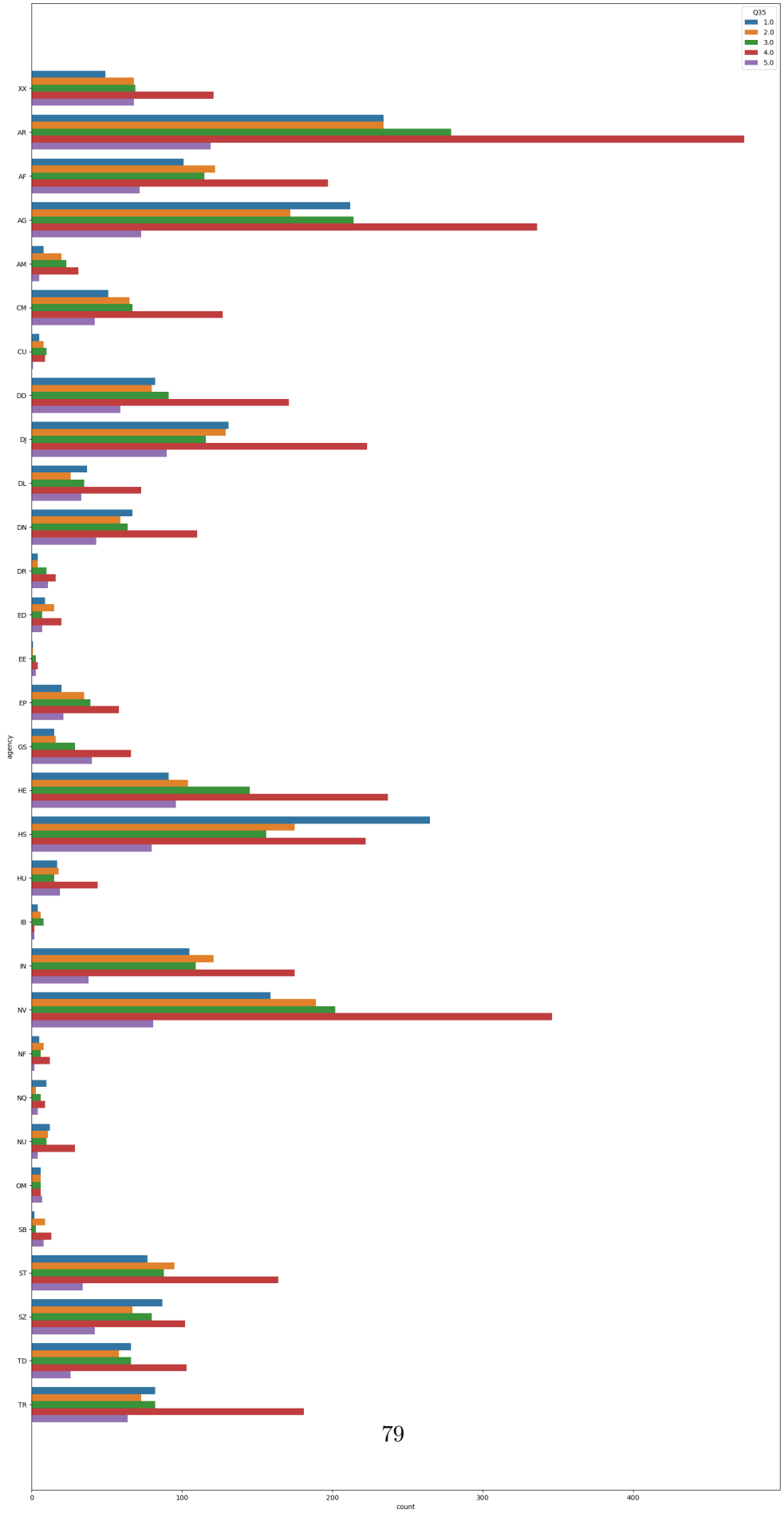
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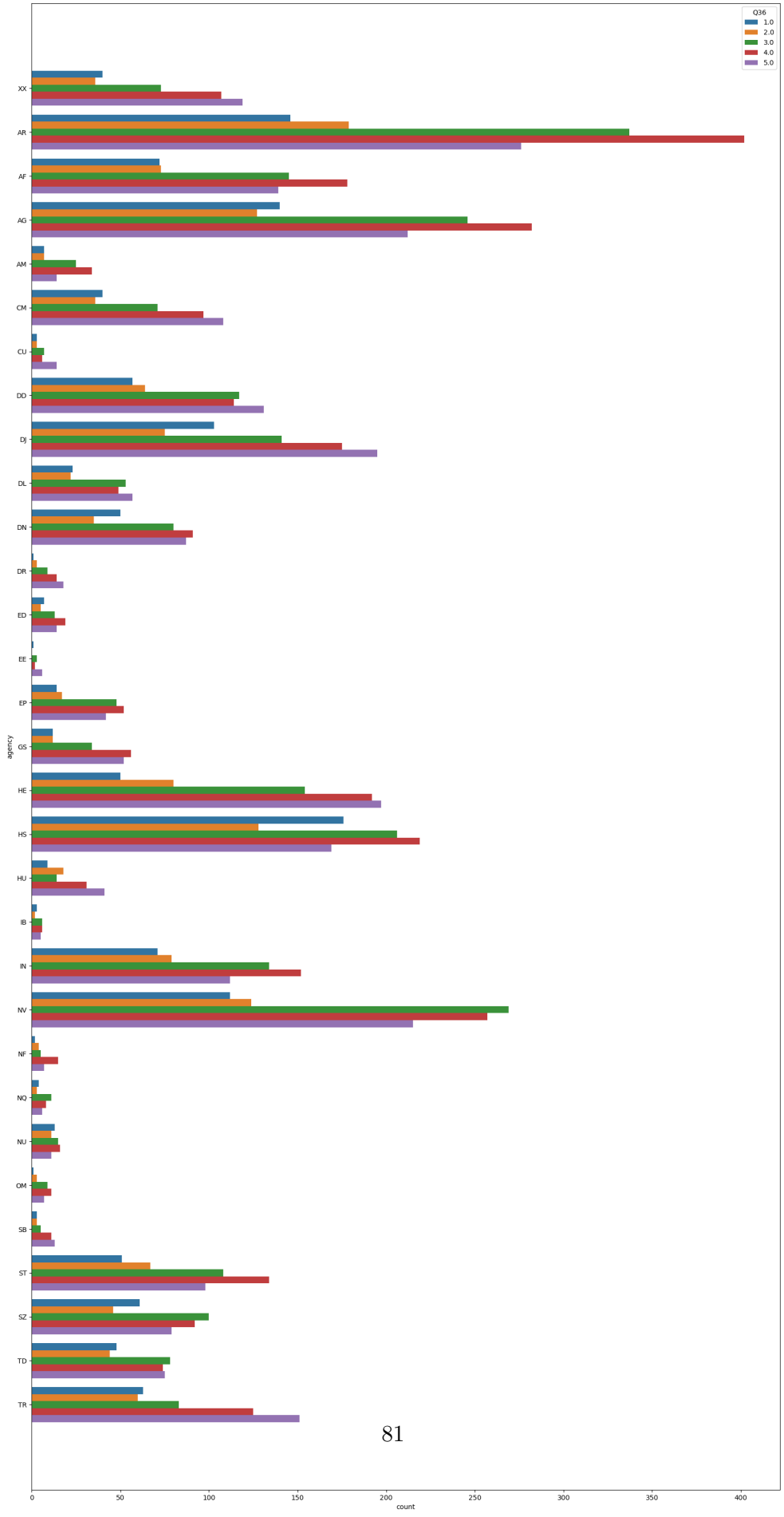
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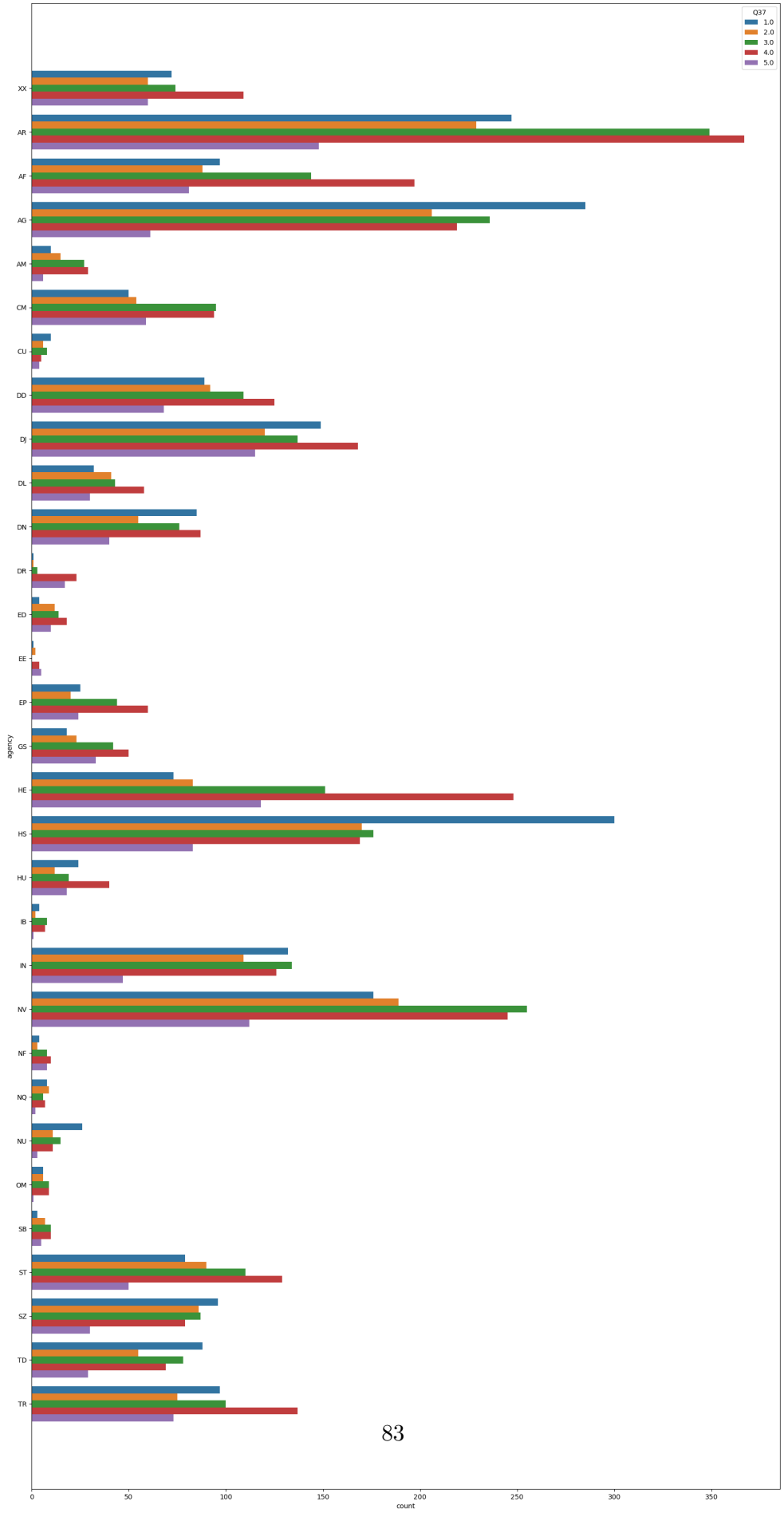
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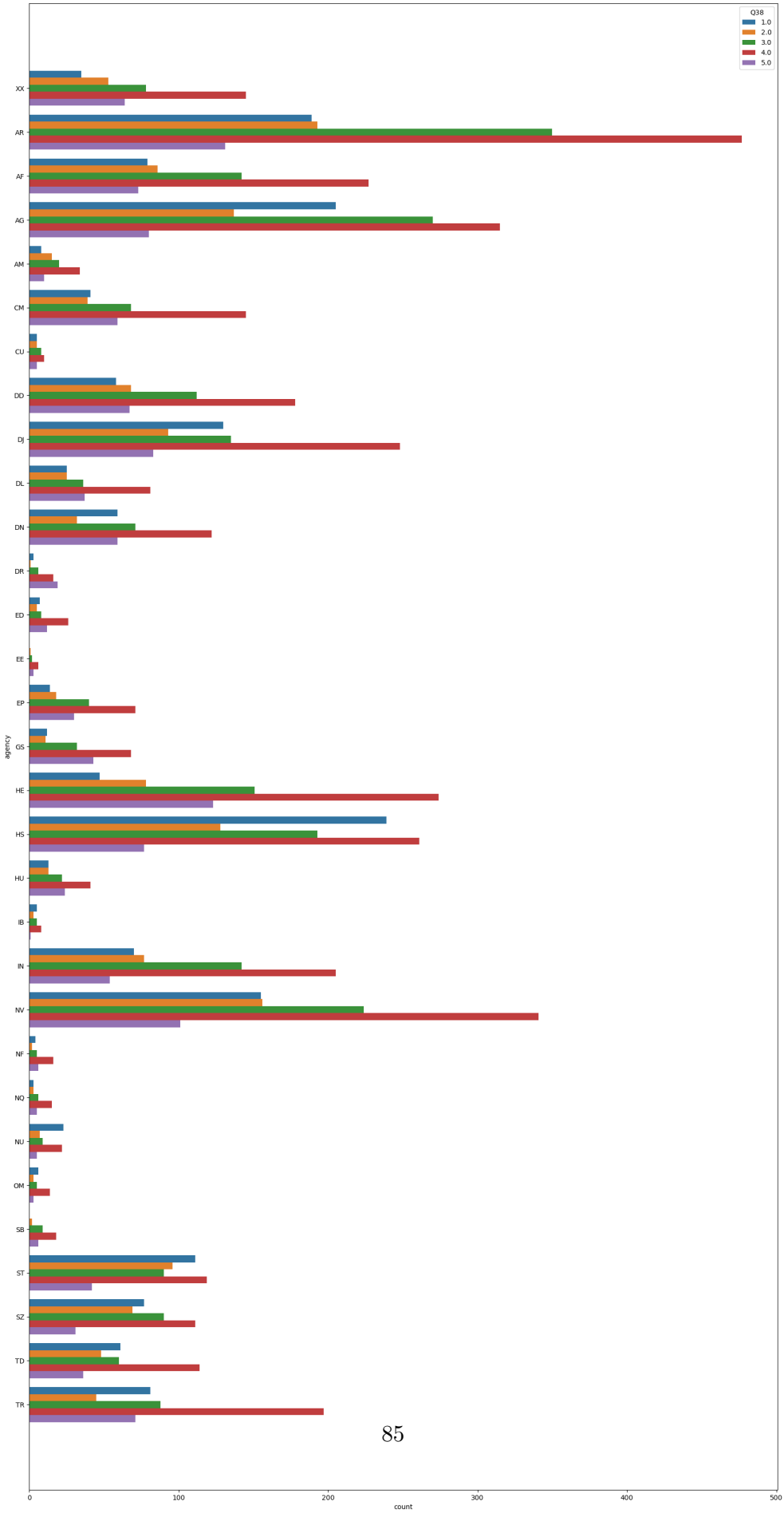
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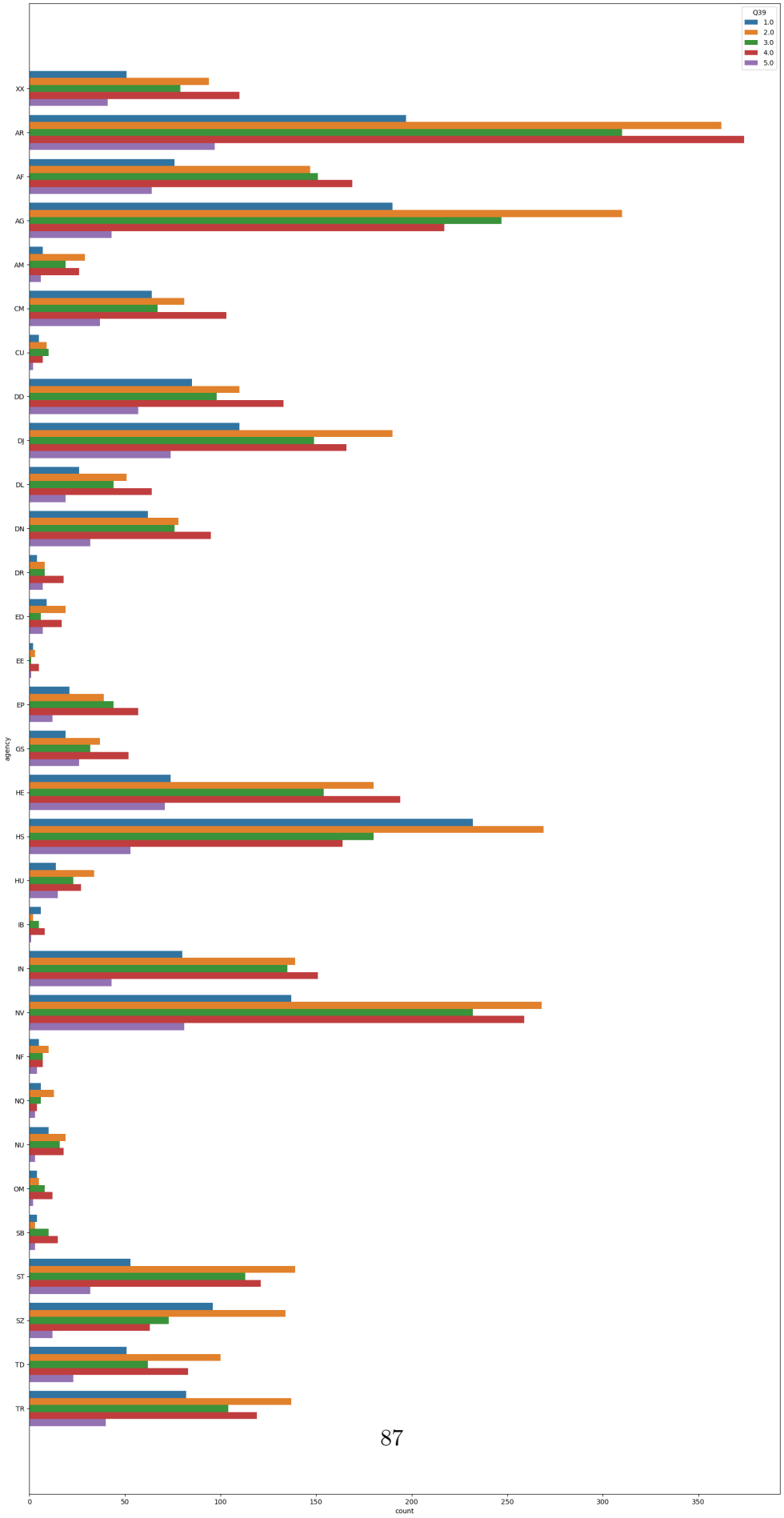
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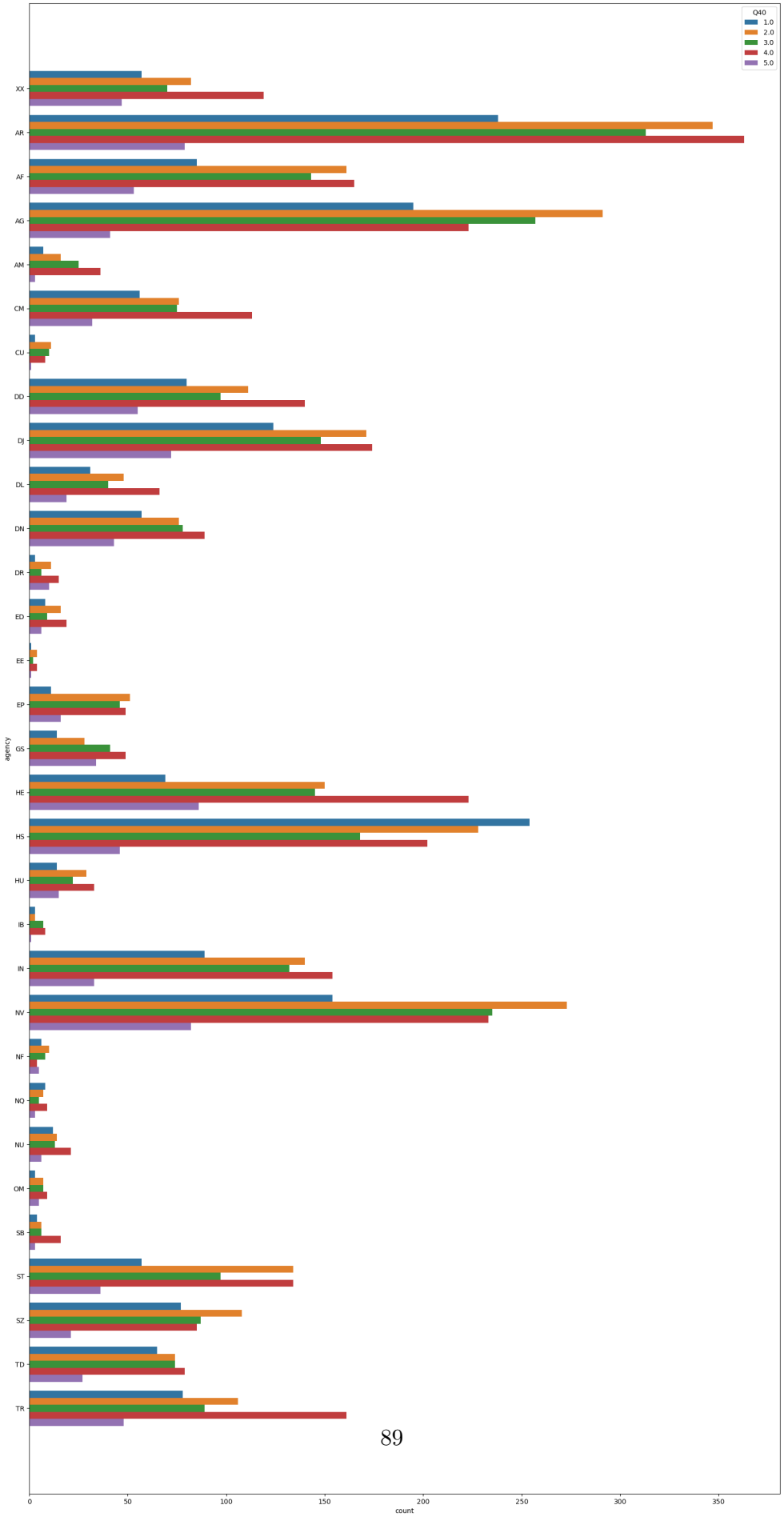
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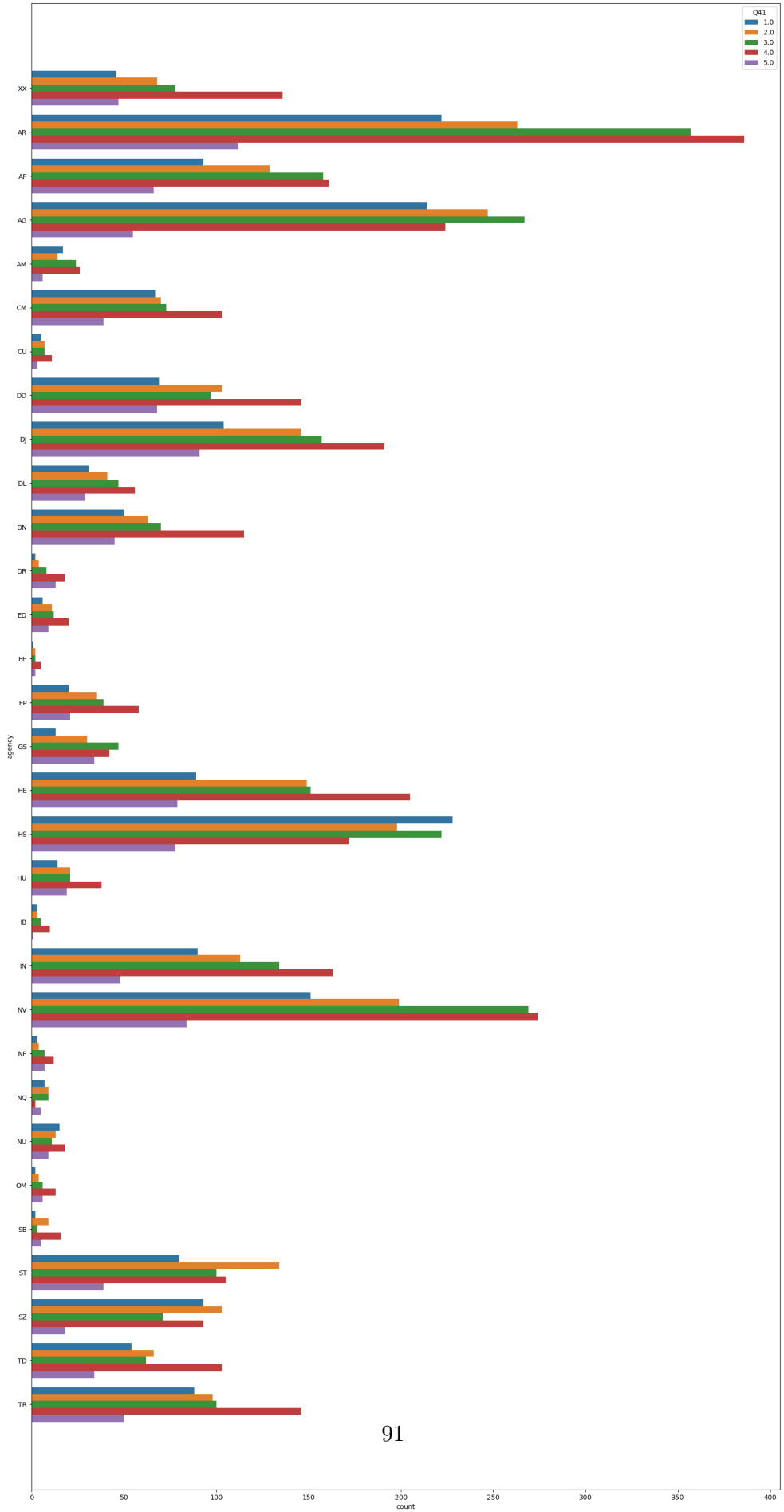
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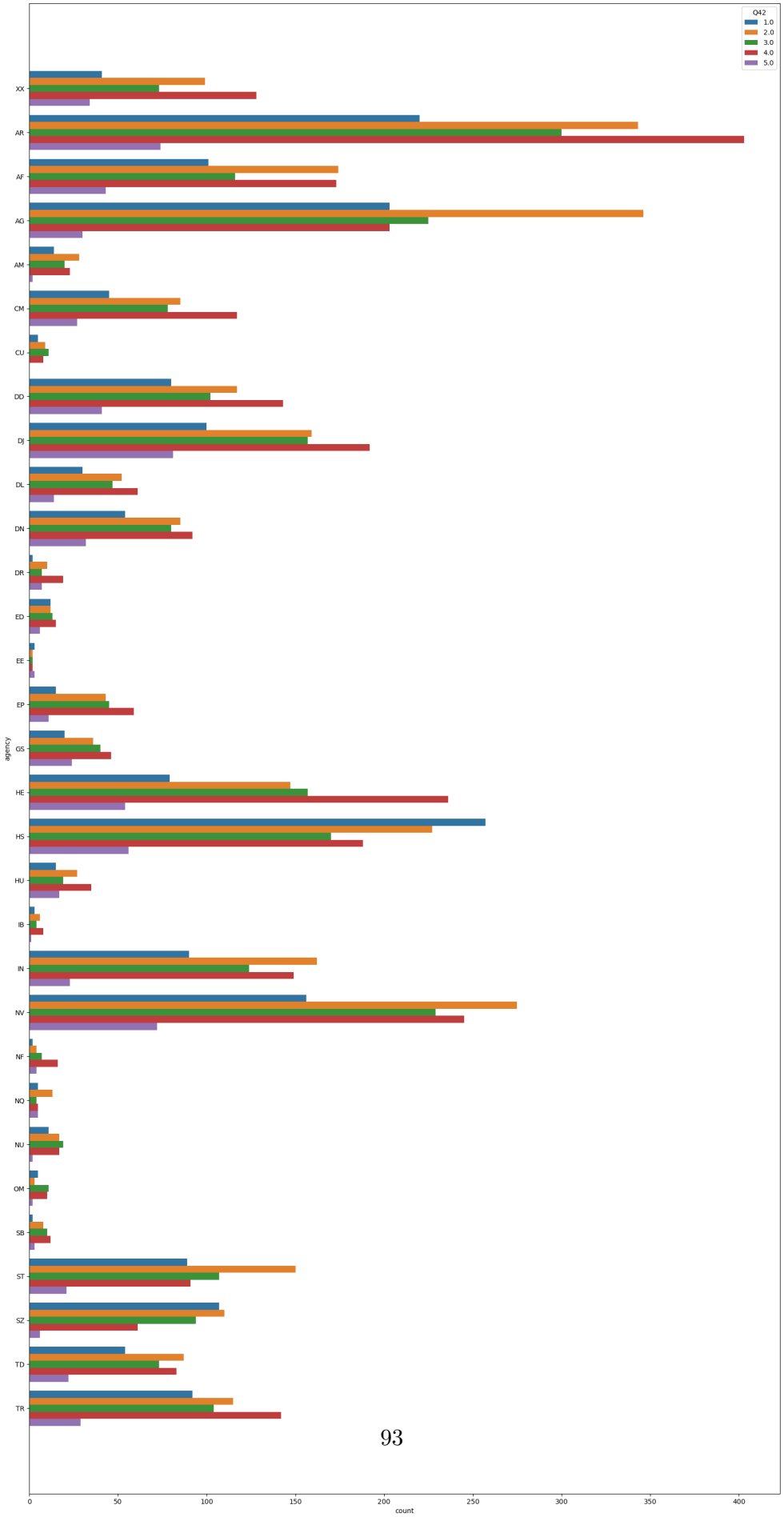
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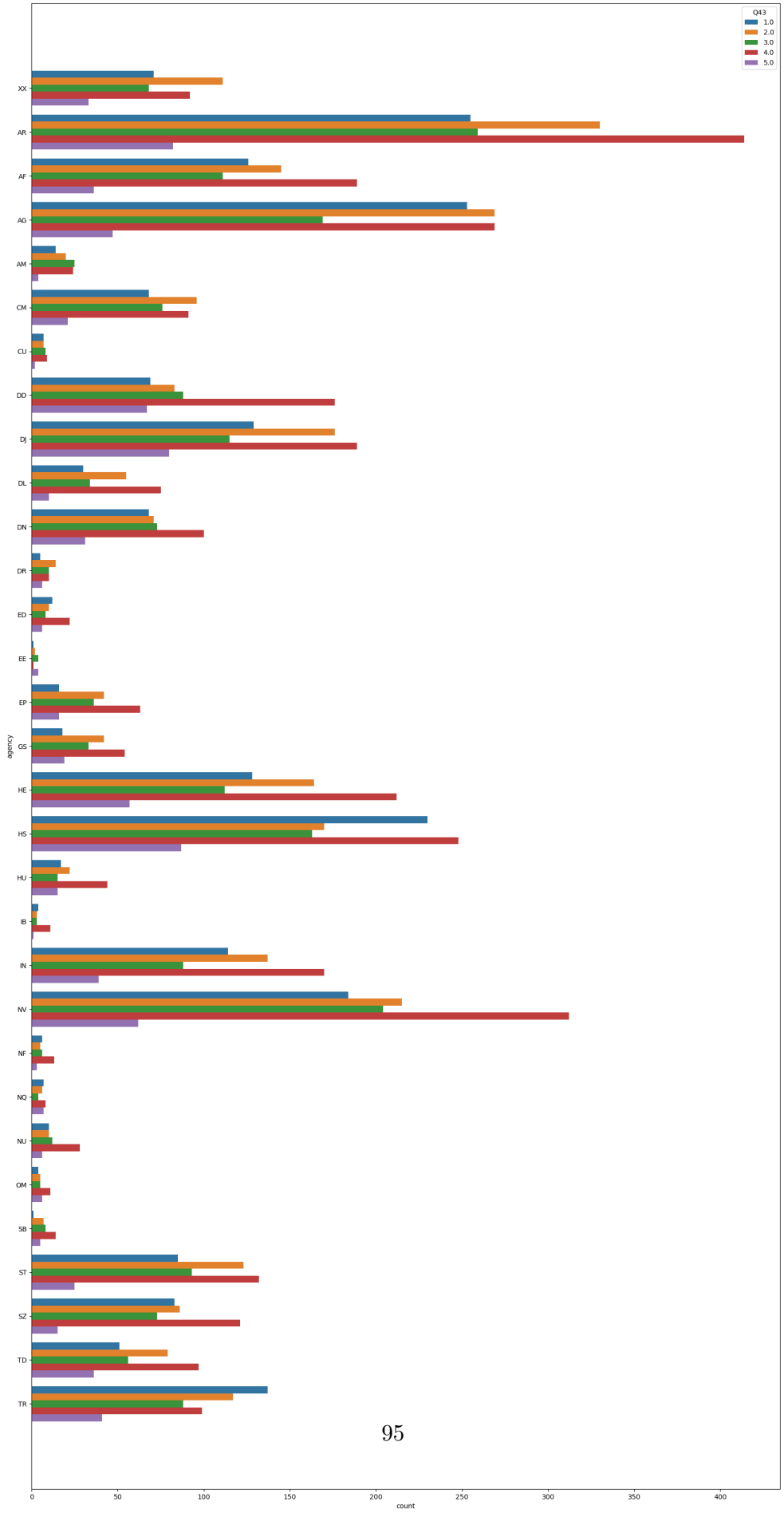
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