project_graph1B

Ryan Thackston

3/8/2021

R Markdown

```
library(ggplot2)
library(MASS)
library(tidyverse)
```

```
## -- Attaching packages --------------------------------------- tidyverse 1.3.0 --

## v tibble  3.1.0     v dplyr   1.0.4
## v tidyr   1.1.2     v stringr 1.4.0
## v readr   1.4.0     v forcats 0.5.1
## v purrr   0.3.4

## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
## x dplyr::select() masks MASS::select()
```

```
library(dplyr)
library(sqldf)
```

```
## Loading required package: gsubfn

## Loading required package: proto

## Loading required package: RSQLite
```

```
library(data.table)
```

```
##
## Attaching package: 'data.table'

## The following objects are masked from 'package:dplyr':
##
##     between, first, last

## The following object is masked from 'package:purrr':
##
##     transpose
```

```
library(ggtext)
library(gridExtra)
```

```
##
## Attaching package: 'gridExtra'
```

```
## The following object is masked from 'package:dplyr':
##
##     combine
```

```
library(gtable)
library(cowplot)
library(grid)
library(egg)
library(e1071)

# Choose ArticleLevel-RegData-ALLSA_Xc_1_NData_655386_LONGXCIP2.csv
dataFromCSV<-read.csv(file.choose())

fd<-dataFromCSV %>%
  group_by(Yp, NSAp, Zp>0) %>%
  summarise(
    cnt = n()
  ) %>%
  filter(
    Yp>1979
  )
```

```
## `summarise()` has grouped output by 'Yp', 'NSAp'. You can override using the `.groups` argument.
```

```
yrcnt = NULL
years = 1980:2018

for (i in 1:length(years)){
  hht <- filter(fd, Yp==i+1979)
  yrcnt[i] <- ( sum(hht[4]))
}

yrcnt
```

```
##  [1]  1486  1745  1983  2306  2473  2982  3237  3839  4388  4659  4993  5681
## [13]  6195  6843  7398  8530  8888 10195 10974 11834 12780 14289 15955 18041
## [25] 20846 22941 25720 27416 29938 32313 33634 36421 36828 36985 36653 35973
## [37] 35150 33516 31371
```

```
##########################################
# FIGURE 2A - 1st Graph SA Categories
##########################################

# Specify years and categories to analyze
years <- 1980:2018
```

```r
cats <- 1:4


# Create matrix to store SA papers in specified categories by years
yrSAcat <- matrix(data=NA,nrow= length(cats)*2, ncol=length(years) )

# Create vectors to store total SA papers with below average citations in specified categories by years
yrSAtotNEG <- matrix(data=NA, nrow = 1, ncol = length(years))

# Create vectors to store total SA papers with above average citations in specified categories by years
yrSAtotPOS <- matrix(data=NA, nrow = 1, ncol = length(years))



# create negative & positive arrays to store values from yrSAcat
negarr_SA <- (cats-1)*2+1
posarr_SA <- (cats)*2




for (i in 1:length(years)){
  for (j in 1:(length(cats)*2)){
    rr <- filter(fd, Yp == (i+1979) )
    yrSAcat[j,i] <- rr[[j,4]]
  }
  yrSAtotNEG[1,i] <- sum(yrSAcat[negarr_SA,i])
  yrSAtotPOS[1,i] <- sum(yrSAcat[posarr_SA,i])

}



colnames(yrSAcat) <- c(1980:2018)
rownames(yrSAcat) <- c("SA1 Zp-", "SA1 Zp+", "SA2 Zp-", "SA2 Zp+", "SA3 Zp-", "SA3 Zp+", "SA4 Zp-", "SA
colnames(yrSAtotNEG) <- paste(1980:2018, "Neg Cite.")
colnames(yrSAtotPOS) <- paste(1980:2018, "Pos Cite.")



SApercTotNEG <- matrix(data=NA, nrow = length(cats), ncol = length(years))
SApercTotPOS <- matrix(data=NA, nrow = length(cats), ncol = length(years))



for (i in 1:length(years)){
  for (j in 1:length(cats) ) {
    SApercTotNEG[j,i] <- yrSAcat[((j-1)*2+1),i]/yrSAtotNEG[1,i]
    SApercTotPOS[j,i] <- yrSAcat[(j*2),i]/yrSAtotPOS[1,i]
  }
}
```

```r
#colnames(SApercTot) <- c(1980:2018)
rownames(SApercTotNEG) <- c("SA1 Zp- ", "SA2 Zp- ", "SA3 Zp- ", "SA4 Zp- ")
rownames(SApercTotPOS) <- c("SA1 Zp+ ", "SA2 Zp+ ", "SA3 Zp+ ", "SA4 Zp+ ")


#####################################
# FIGURE 2A - 2nd Graph CIP Categories
#####################################

# Specify years and categories to analyze
years <- 1980:2018
cats <- 1:4

# Store CIP values of all categories from CSV data
CIPp<-dataFromCSV %>%
  group_by(Yp, NCIPp, Zp>0) %>%
  summarise(
    cnt = n()
  ) %>%
  filter(
    Yp>1979
  )
```

```
## `summarise()` has grouped output by 'Yp', 'NCIPp'. You can override using the `.groups` argument.
```

```r
# Create matrix to store CIP papers in specified categories by years
yrCIPcat <- matrix(data=NA,nrow= length(cats)*2, ncol=length(years) )

# Create vectors to store total CIP papers with below average citations in specified categories by year
yrCIPtotNEG <- matrix(data=NA, nrow = 1, ncol = length(years))
# Create vectors to store total CIP papers with above average citations in specified categories by year
yrCIPtotPOS <- matrix(data=NA, nrow = 1, ncol = length(years))

# create negative & positive arrays to store values from yrCIPcat
negarr_CIP <- (cats-1)*2+1
posarr_CIP <- (cats)*2

zer <- matrix(data = 0, nrow = 8, ncol = 4)
tt2 <- tibble(Yp =(Yp = zer[1:8]), NCIPp=as.integer(0), 'Zp > 0'=FALSE, cnt= as.integer(0))

for (i in 1:length(years)){
  tt <- filter(CIPp, Yp == (i+1979) )
  if (dim(tt)[1] < 8){
    tt2 <- tibble(Yp = as.integer(zer[(8-dim(tt)[1]):8]), NCIPp=as.integer(0), 'Zp > 0'=FALSE, cnt= as.
    tt <- tt %>% full_join(tt2,by=NULL)
  }
  for (j in 1:dim(tt)[1]){
    if (j>8){
      next
    }

    yrCIPcat[j,i] <- tt[[j,4]]
```

```
  }
  yrCIPtotNEG[1,i] <- sum(yrCIPcat[negarr_CIP,i])
  yrCIPtotPOS[1,i] <- sum(yrCIPcat[posarr_CIP,i])
}
```

```
## Joining, by = c("Yp", "NCIPp", "Zp > 0", "cnt")
```

```
## Joining, by = c("Yp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NCIPp", "Zp > 0", "cnt")
```

```
colnames(yrCIPcat) <- c(1980:2018)
rownames(yrCIPcat) <- c("CIP1 Zp-", "CIP1 Zp+", "CIP2 Zp-", "CIP2 Zp+", "CIP3 Zp-", "CIP3 Zp+", "CIP4 Z
colnames(yrCIPtotNEG) <- paste(1980:2018, "Neg Cite.")
colnames(yrCIPtotPOS) <- paste(1980:2018, "Pos Cite.")

CIPpercTotNEG <- matrix(data=NA, nrow = length(cats), ncol = length(years))
CIPpercTotPOS <- matrix(data=NA, nrow = length(cats), ncol = length(years))

for (i in 1:length(years)){
  for (j in 1:length(cats) ) {
    CIPpercTotNEG[j,i] <- yrCIPcat[((j-1)*2+1),i]/yrCIPtotNEG[1,i]
    CIPpercTotPOS[j,i] <- yrCIPcat[(j*2),i]/yrCIPtotPOS[1,i]
  }
}

colnames(CIPpercTotNEG) <- c(1980:2018)
colnames(CIPpercTotPOS) <- c(1980:2018)

rownames(CIPpercTotNEG) <- c("CIP1 Zp- %", "CIP2 Zp- %", "CIP3 Zp- %", "CIP4 Zp- %")
rownames(CIPpercTotPOS) <- c("CIP1 Zp+ %", "CIP2 Zp+ %", "CIP3 Zp+ %", "CIP4 Zp+ %")



##############################################
# FIGURE 2A - 3rd Graph SA & CIP Categories
##############################################

# Specify years and categories to analyze
years <- 1980:2018
cats <- 1:4
```

```
SA_CIP1 <- dataFromCSV %>%
  group_by(Yp, NSAp, NCIPp, Zp>0) %>%
  summarise(
    cnt = n()
  ) %>%
  filter(NCIPp == 1 &
           NSAp == 1 & Yp>1979)
```

```
## `summarise()` has grouped output by 'Yp', 'NSAp', 'NCIPp'. You can override using the `.groups` argu
```

```
SA_CIP2 <- dataFromCSV %>%
  group_by(Yp, NSAp, NCIPp, Zp>0) %>%
  summarise(
    cnt = n()
  ) %>%
  filter(NCIPp == 2 &
           NSAp == 2 &
           Yp>1979)
```

```
## `summarise()` has grouped output by 'Yp', 'NSAp', 'NCIPp'. You can override using the `.groups` argu
```

```
SA_CIP3 <- dataFromCSV %>%
  group_by(Yp, NSAp, NCIPp, Zp>0) %>%
  summarise(
    cnt = n()
  ) %>%
  filter(NCIPp == 3 &
           NSAp == 3 &
           Yp>1979)
```

```
## `summarise()` has grouped output by 'Yp', 'NSAp', 'NCIPp'. You can override using the `.groups` argu
```

```
SA_CIP4 <- dataFromCSV %>%
  group_by(Yp, NSAp, NCIPp, Zp>0) %>%
  summarise(
    cnt = n()
  ) %>%
  filter(NCIPp == 4 &
           NSAp == 4 &
           Yp>1979)
```

```
## `summarise()` has grouped output by 'Yp', 'NSAp', 'NCIPp'. You can override using the `.groups` argu
```

```
SA_CIP <- SA_CIP1 %>% full_join(SA_CIP2, by = NULL) %>% full_join(SA_CIP3, by = NULL) %>% full_join(SA_
```

```
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
```

```
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
```

```r
# Create matrix to store SA_CIP papers in specified categories by years
yrSA_CIPcatNEG1 <- tibble(Yp = 0, NSAp=0, NCIPp=0, `Zp > 0`=FALSE, cnt= 0)
yrSA_CIPcatPOS1 <- tibble(Yp = 0, NSAp=0, NCIPp=0, `Zp > 0`=TRUE,  cnt= 0)
yrSA_CIPcatNEG2 <- tibble(Yp = 0, NSAp=0, NCIPp=0, `Zp > 0`=FALSE, cnt= 0)
yrSA_CIPcatPOS2 <- tibble(Yp = 0, NSAp=0, NCIPp=0, `Zp > 0`=TRUE,  cnt= 0)
yrSA_CIPcatNEG3 <- tibble(Yp = 0, NSAp=0, NCIPp=0, `Zp > 0`=FALSE, cnt= 0)
yrSA_CIPcatPOS3 <- tibble(Yp = 0, NSAp=0, NCIPp=0, `Zp > 0`=TRUE,  cnt= 0)
yrSA_CIPcatNEG4 <- tibble(Yp = 0, NSAp=0, NCIPp=0, `Zp > 0`=FALSE, cnt= 0)
yrSA_CIPcatPOS4 <- tibble(Yp = 0, NSAp=0, NCIPp=0, `Zp > 0`=TRUE,  cnt= 0)

# Create vectors to store total CIP papers with below average citations in specified categories by year
yrSA_CIPtotNEG <- matrix(data=NA, nrow = 1, ncol = length(years))


# Create vectors to store total CIP papers with above average citations in specified categories by year
yrSA_CIPtotPOS <- matrix(data=NA, nrow = 1, ncol = length(years))


# tmp1 <- tibble(Yp = as.integer(Yp = zer[1:8]), NCIPp=as.integer(0), 'Zp > 0'=FALSE, cnt= as.integer(0
for (i in 1:length(years) ){

  # Filter SA_CIP of all categories
  tmp1 <- filter(SA_CIP, Yp == (i+1979) )

  yrSA_CIPcatNEG1 <- yrSA_CIPcatNEG1 %>% full_join(filter(tmp1, (NCIPp == 1 | NSAp == 1) & `Zp > 0` ==
  yrSA_CIPcatPOS1 <- yrSA_CIPcatPOS1 %>% full_join(filter(tmp1, (NCIPp == 1 | NSAp == 1) & `Zp > 0` ==

  yrSA_CIPcatNEG2 <- yrSA_CIPcatNEG2 %>% full_join(filter(tmp1, (NCIPp == 2 | NSAp == 2) & `Zp > 0` ==
  yrSA_CIPcatPOS2 <- yrSA_CIPcatPOS2 %>% full_join(filter(tmp1, (NCIPp == 2 | NSAp == 2) & `Zp > 0` ==

  yrSA_CIPcatNEG3 <- yrSA_CIPcatNEG3 %>% full_join(filter(tmp1, (NCIPp == 3 | NSAp == 3) & `Zp > 0` ==
  yrSA_CIPcatPOS3 <- yrSA_CIPcatPOS3 %>% full_join(filter(tmp1, (NCIPp == 3 | NSAp == 3) & `Zp > 0` ==

  yrSA_CIPcatNEG4 <- yrSA_CIPcatNEG4 %>% full_join(filter(tmp1, (NCIPp == 4 | NSAp == 4) & `Zp > 0` ==
  yrSA_CIPcatPOS4 <- yrSA_CIPcatPOS4 %>% full_join(filter(tmp1, (NCIPp == 4 | NSAp == 4) & `Zp > 0` ==

  #  }


  yrSA_CIPtotNEG[1,i] <- sum(filter(tmp1, `Zp > 0` == FALSE)[[5]])
  yrSA_CIPtotPOS[1,i] <- sum(filter(tmp1, `Zp > 0` == TRUE)[[5]])

}
```

```
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
```

```
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
```

```
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
```

```
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
```

```
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
```

```
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
```

```
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
## Joining, by = c("Yp", "NSAp", "NCIPp", "Zp > 0", "cnt")
```

```
#colnames(yrSA_CIPcat) <- c(1980:2018)
#rownames(yrSA_CIPcat) <- c("SA_CIP1 Zp-", "SA_CIP1 Zp+", "SA_CIP2 Zp-", "SA_CIP2 Zp+", "SA_CIP3 Zp-",

colnames(yrSA_CIPtotNEG) <- paste(1980:2018, "Neg Cite.")
colnames(yrSA_CIPtotPOS) <- paste(1980:2018, "Pos Cite.")

SA_CIPpercTotNEG <- matrix(data=NA, nrow = length(cats), ncol = length(years))
SA_CIPpercTotPOS <- matrix(data=NA, nrow = length(cats), ncol = length(years))

for (i in 1:length(years)){

  SA_CIPpercTotNEG[1,i] <- sum(filter(yrSA_CIPcatNEG1, Yp == i + 1979)[[5]]) / yrSA_CIPtotNEG[1,i]
  SA_CIPpercTotPOS[1,i] <- sum(filter(yrSA_CIPcatPOS1, Yp == i + 1979)[[5]]) / yrSA_CIPtotPOS[1,i]

  SA_CIPpercTotNEG[2,i] <- sum(filter(yrSA_CIPcatNEG2, Yp == i + 1979)[[5]]) / yrSA_CIPtotNEG[1,i]
  SA_CIPpercTotPOS[2,i] <- sum(filter(yrSA_CIPcatPOS2, Yp == i + 1979)[[5]]) / yrSA_CIPtotPOS[1,i]

  SA_CIPpercTotNEG[3,i] <- sum(filter(yrSA_CIPcatNEG3, Yp == i + 1979)[[5]]) / yrSA_CIPtotNEG[1,i]
  SA_CIPpercTotPOS[3,i] <- sum(filter(yrSA_CIPcatPOS3, Yp == i + 1979)[[5]]) / yrSA_CIPtotPOS[1,i]
```

```
  SA_CIPpercTotNEG[4,i] <- sum(filter(yrSA_CIPcatNEG4, Yp == i + 1979)[[5]]) / yrSA_CIPtotNEG[1,i]
  SA_CIPpercTotPOS[4,i] <- sum(filter(yrSA_CIPcatPOS4, Yp == i + 1979)[[5]]) / yrSA_CIPtotPOS[1,i]
}

colnames(SA_CIPpercTotNEG) <- c(1980:2018)
colnames(SA_CIPpercTotPOS) <- c(1980:2018)

rownames(SA_CIPpercTotNEG) <- c("SA_CIP1 Zp- %", "SA_CIP2 Zp- %", "SA_CIP3 Zp- %", "SA_CIP4 Zp- %")
rownames(SA_CIPpercTotPOS) <- c("SA_CIP1 Zp+ %", "SA_CIP2 Zp+ %", "SA_CIP3 Zp+ %", "SA_CIP4 Zp+ %")


SA_CIPpercTotPOS
```

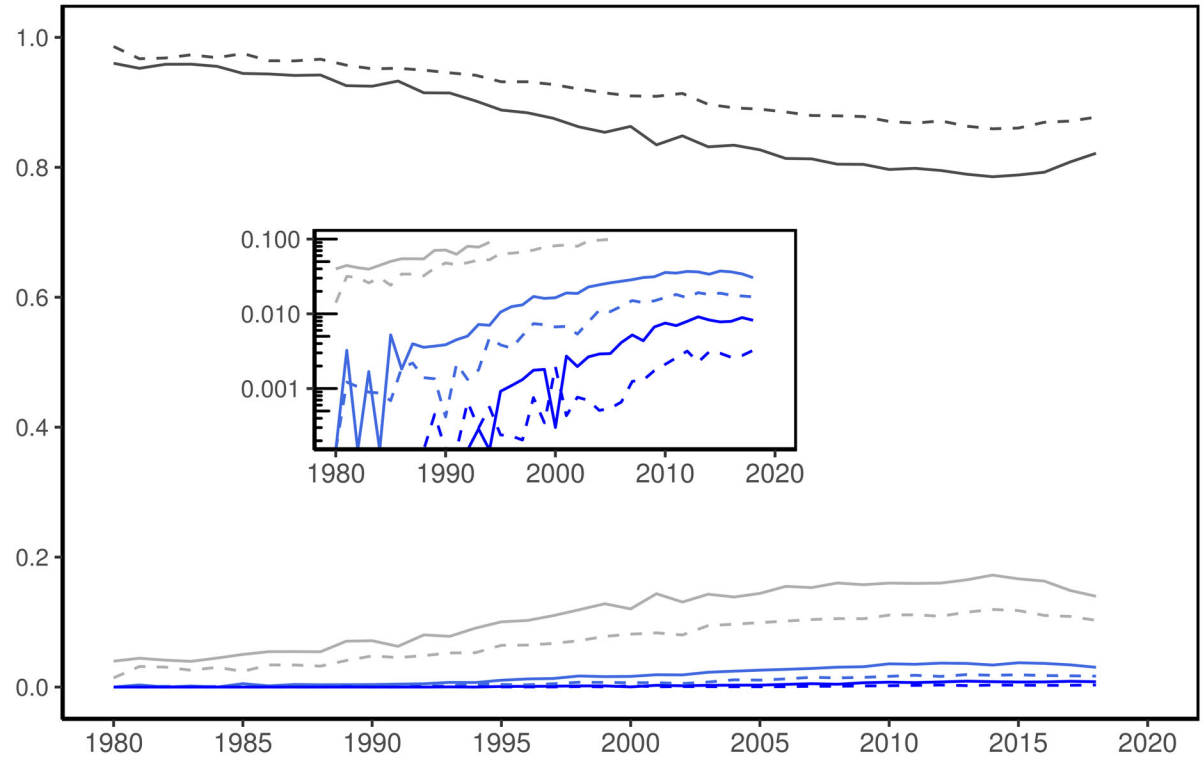
```
##                      1980        1981       1982       1983       1984      1985
## SA_CIP1 Zp+ % 0.9736211 0.959139785 0.96653543 0.97227036 0.97147385 0.9595537
## SA_CIP2 Zp+ % 0.0263789 0.036559140 0.03346457 0.02772964 0.02852615 0.0390516
## SA_CIP3 Zp+ % 0.0000000 0.004301075 0.00000000 0.00000000 0.00000000 0.0013947
## SA_CIP4 Zp+ % 0.0000000 0.000000000 0.00000000 0.00000000 0.00000000 0.0000000
##                      1986        1987        1988        1989        1990
## SA_CIP1 Zp+ % 0.95318596 0.951136364 0.942166141 0.934077079 0.933844679
## SA_CIP2 Zp+ % 0.04551365 0.047727273 0.055730810 0.060851927 0.063279003
## SA_CIP3 Zp+ % 0.00130039 0.001136364 0.002103049 0.005070994 0.002876318
## SA_CIP4 Zp+ % 0.00000000 0.000000000 0.000000000 0.000000000 0.000000000
##                      1991        1992        1993       1994       1995
## SA_CIP1 Zp+ % 0.948181818 0.918964077 0.910771704 0.89301310 0.89095574
## SA_CIP2 Zp+ % 0.047272727 0.079365079 0.084405145 0.10334789 0.09685696
## SA_CIP3 Zp+ % 0.004545455 0.001670844 0.004823151 0.00363901 0.01218730
## SA_CIP4 Zp+ % 0.000000000 0.000000000 0.000000000 0.00000000 0.00000000
##                      1996       1997       1998        1999         2000
## SA_CIP1 Zp+ % 0.8670143416 0.85855072 0.83242059 0.820031299 0.8430992736
## SA_CIP2 Zp+ % 0.1173402868 0.12405797 0.14731654 0.156494523 0.1433414044
## SA_CIP3 Zp+ % 0.0149934811 0.01565217 0.01916758 0.022430882 0.0130750605
## SA_CIP4 Zp+ % 0.0006518905 0.00173913 0.00109529 0.001043297 0.0004842615
##                      2001        2002        2003        2004        2005
## SA_CIP1 Zp+ % 0.808633734 0.819243156 0.796847008 0.800247372 0.783571221
## SA_CIP2 Zp+ % 0.171339564 0.161030596 0.174131136 0.169449598 0.185843286
## SA_CIP3 Zp+ % 0.018691589 0.018518519 0.027230383 0.028138528 0.029129042
## SA_CIP4 Zp+ % 0.001335113 0.001207729 0.001791473 0.002164502 0.001456452
##                      2006       2007        2008        2009        2010
## SA_CIP1 Zp+ % 0.777632268 0.75808056 0.745620182 0.748487468 0.721241761
## SA_CIP2 Zp+ % 0.191985333 0.20313277 0.209296893 0.206352636 0.229002764
## SA_CIP3 Zp+ % 0.029334730 0.03580308 0.042046251 0.039974071 0.046353391
## SA_CIP4 Zp+ % 0.001047669 0.00298359 0.003036674 0.005185825 0.003402084
##                      2011        2012        2013        2014        2015
## SA_CIP1 Zp+ % 0.722359227 0.704897959 0.705371567 0.697417743 0.686005314
## SA_CIP2 Zp+ % 0.229346486 0.241020408 0.243336026 0.254060808 0.258193091
## SA_CIP3 Zp+ % 0.044184135 0.049183673 0.044830372 0.043315285 0.050487157
## SA_CIP4 Zp+ % 0.004110152 0.004897959 0.006462036 0.005206164 0.005314438
##                      2016        2017        2018
## SA_CIP1 Zp+ % 0.688063311 0.726166329 0.735719726
## SA_CIP2 Zp+ % 0.259177841 0.224898580 0.218075654
## SA_CIP3 Zp+ % 0.047922620 0.043103448 0.041127190
## SA_CIP4 Zp+ % 0.004836228 0.005831643 0.005077431
```

```
years <- 1980:2018

#PLOTTING for SA

p1 = data.frame(years=years, Fraction = (SApercTotPOS[1,]))
p2 = data.frame(years=years, Fraction = (SApercTotPOS[2,]))
p3 = data.frame(years=years, Fraction = SApercTotPOS[3,])
p4 = data.frame(years=years, Fraction = (SApercTotPOS[4,]))


n1 = data.frame(years=years, Fraction = (SApercTotNEG[1,]))
n2 = data.frame(years=years, Fraction = (SApercTotNEG[2,]))
n3 = data.frame(years=years, Fraction = SApercTotNEG[3,])
n4 = data.frame(years=years, Fraction = (SApercTotNEG[4,]))

e1<-ggplot()+geom_line(data=p1, mapping = aes(x=years,y=Fraction), size=0.5, color="grey30") + geom_lin
             geom_line(data=p3, mapping = aes(x=years,y=Fraction), size=0.5, color="royalblue") + geom_
             geom_line(data=n1, mapping = aes(x=years,y=Fraction), linetype = "dashed", size=0.5, color
             geom_line(data=n3, mapping = aes(x=years,y=Fraction), linetype = "dashed", size=0.5, color

e2<-e1+theme_bw() + theme(panel.border = element_rect(colour = "black", fill=NA, size=1), panel.grid.ma
                      panel.grid.minor = element_blank(), axis.line = element_line(colour = "black"),
                      axis.text.x   = element_text(size=10))
e3<-e2+scale_x_continuous(limits=c(1980, 2020), breaks=seq(1980, 2020, 5))+scale_y_continuous(limits=c(


e4<-e3+labs(title = "", x = "", y = "")


e5<-e4+ scale_color_manual(name = "Y series")




#Plotting for CIP




cp1 = data.frame(years=years, Fraction = (CIPpercTotPOS[1,]))
cp2 = data.frame(years=years, Fraction = (CIPpercTotPOS[2,]))
cp3 = data.frame(years=years, Fraction = (CIPpercTotPOS[3,]))
cp4 = data.frame(years=years, Fraction = (CIPpercTotPOS[4,]))


cn1 = data.frame(years=years, Fraction = (CIPpercTotNEG[1,]))
cn2 = data.frame(years=years, Fraction = (CIPpercTotNEG[2,]))
cn3 = data.frame(years=years, Fraction = (CIPpercTotNEG[3,]))
cn4 = data.frame(years=years, Fraction = (CIPpercTotNEG[4,]))

ce1<-ggplot()+geom_line(data=cp1, mapping = aes(x=years,y=Fraction), size=0.5, color="grey30") + geom_li
  geom_line(data=cp3, mapping = aes(x=years,y=Fraction), size=0.5, color="royalblue") + geom_line(data=
```

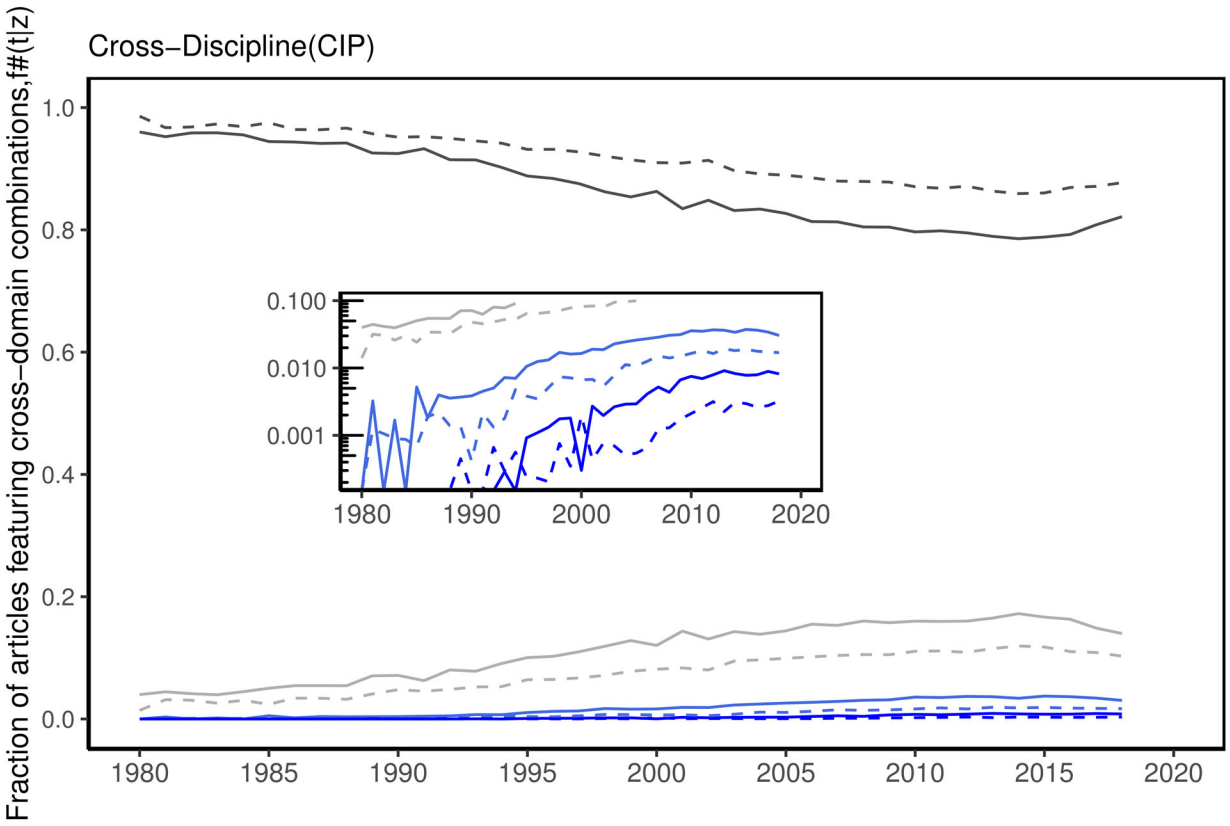
```
  geom_line(data=cn1, mapping = aes(x=years,y=Fraction), linetype = "dashed", size=0.5, color="grey30")
  geom_line(data=cn3, mapping = aes(x=years,y=Fraction), linetype = "dashed", size=0.5, color="royalblu

ce2<-ce1+theme_bw() + theme(panel.border = element_rect(colour = "black", fill=NA, size=1), panel.grid.
                            panel.grid.minor = element_blank(), axis.line = element_line(colour = "black"
                            axis.text.x   = element_text(size=10))
ce3<-ce2+scale_x_continuous(limits=c(1980, 2020), breaks=seq(1980, 2020, 5))+scale_y_continuous(limits=


ce4<-ce3+labs(title = "", x = "", y = "")


ce5<-ce4 +annotation_custom(
  ggplotGrob(ce4+annotation_logticks() +
               scale_y_log10(limits = c(NA,0.1))+scale_x_continuous(limits=c(1980, 2020), breaks=seq(198
  xmin = 1983, xmax = 2007, ymin = 0.23, ymax = 0.8)
```

```
## Scale for 'y' is already present. Adding another scale for 'y', which will
## replace the existing scale.

## Scale for 'x' is already present. Adding another scale for 'x', which will
## replace the existing scale.

## Warning: Transformation introduced infinite values in continuous y-axis

## Warning: Transformation introduced infinite values in continuous y-axis

## Warning: Transformation introduced infinite values in continuous y-axis

## Warning: Transformation introduced infinite values in continuous y-axis

## Warning: Removed 39 row(s) containing missing values (geom_path).

## Warning: Removed 24 row(s) containing missing values (geom_path).

## Warning: Removed 39 row(s) containing missing values (geom_path).

## Warning: Removed 13 row(s) containing missing values (geom_path).
```

```
ce5
```




```
ce5+theme(legend.title = element_text(size=12, color = "salmon", face="bold"),
          legend.justification=c(0,1),
          legend.position=c(0.05, 0.95),
          legend.background = element_blank(),
          legend.key = element_blank()) +
  labs(subtitle="Cross-Discipline(CIP)")+ylab("Fraction of articles featuring cross-domain combinations
```




```
#Plotting for SACIP

scp1 = data.frame(years=years, Fraction = (SA_CIPpercTotPOS[1,]))
scp2 = data.frame(years=years, Fraction = (SA_CIPpercTotPOS[2,]))
scp3 = data.frame(years=years, Fraction = SA_CIPpercTotPOS[3,])
scp4 = data.frame(years=years, Fraction = (SA_CIPpercTotPOS[4,]))


scn1 = data.frame(years=years, Fraction = (SA_CIPpercTotNEG[1,]))
scn2 = data.frame(years=years, Fraction = (SA_CIPpercTotNEG[2,]))
scn3 = data.frame(years=years, Fraction = SA_CIPpercTotNEG[3,])
scn4 = data.frame(years=years, Fraction = (SA_CIPpercTotNEG[4,]))

sce1<-ggplot()+geom_line(data=scp1, mapping = aes(x=years,y=Fraction), size=0.5, color="grey30") + geom
  geom_line(data=scp3, mapping = aes(x=years,y=Fraction), size=1, color="royalblue") + geom_line(data=s
  geom_line(data=scn1, mapping = aes(x=years,y=Fraction), linetype = "dashed", size=0.5, color="grey30"
  geom_line(data=scn3, mapping = aes(x=years,y=Fraction), linetype = "dashed", size=0.5, color="royalblu

sce2<-sce1+theme_bw() + theme(panel.border = element_rect(colour = "black", fill=NA, size=1), panel.gri
                          panel.grid.minor = element_blank(), axis.line = element_line(colour = "black"
                          axis.text.x   = element_text(size=10))
sce3<-sce2+scale_x_continuous(limits=c(1980, 2020), breaks=seq(1980, 2020, 5))+scale_y_continuous(limit


sce4<-sce3+labs(title = "", x = "", y = "")
```

```
sce5<-sce4 +annotation_custom(
  ggplotGrob(sce4+annotation_logticks() +
               scale_y_log10(limits = c(NA,0.1))+scale_x_continuous(limits=c(1980, 2020), breaks=seq(198
  xmin = 1980, xmax = 2005, ymin = 0.19, ymax = 0.79)
```

```
## Scale for 'y' is already present. Adding another scale for 'y', which will
## replace the existing scale.
## Scale for 'x' is already present. Adding another scale for 'x', which will
## replace the existing scale.
```

```
## Warning: Transformation introduced infinite values in continuous y-axis
```

```
## Warning: Transformation introduced infinite values in continuous y-axis
```

```
## Warning: Transformation introduced infinite values in continuous y-axis
```

```
## Warning: Transformation introduced infinite values in continuous y-axis
```

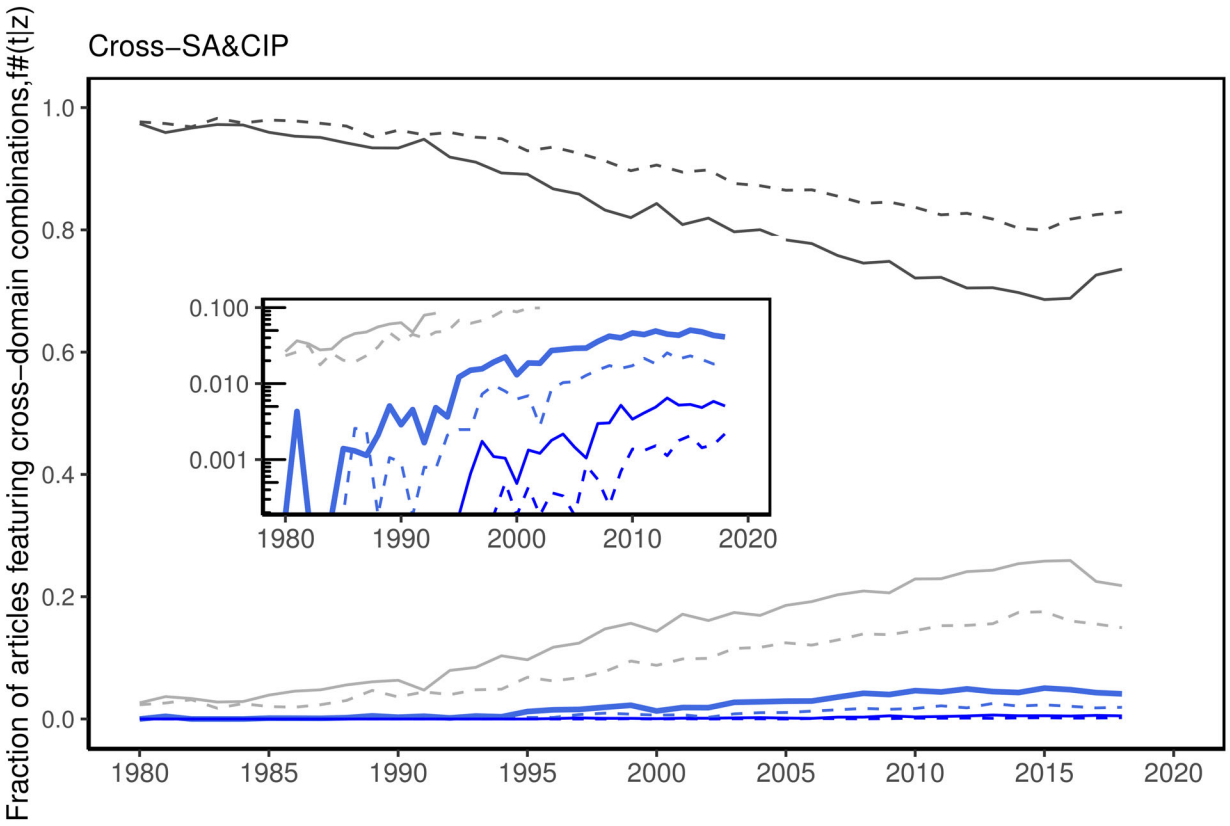
```
## Warning: Removed 39 row(s) containing missing values (geom_path).
```

```
## Warning: Removed 23 row(s) containing missing values (geom_path).
```

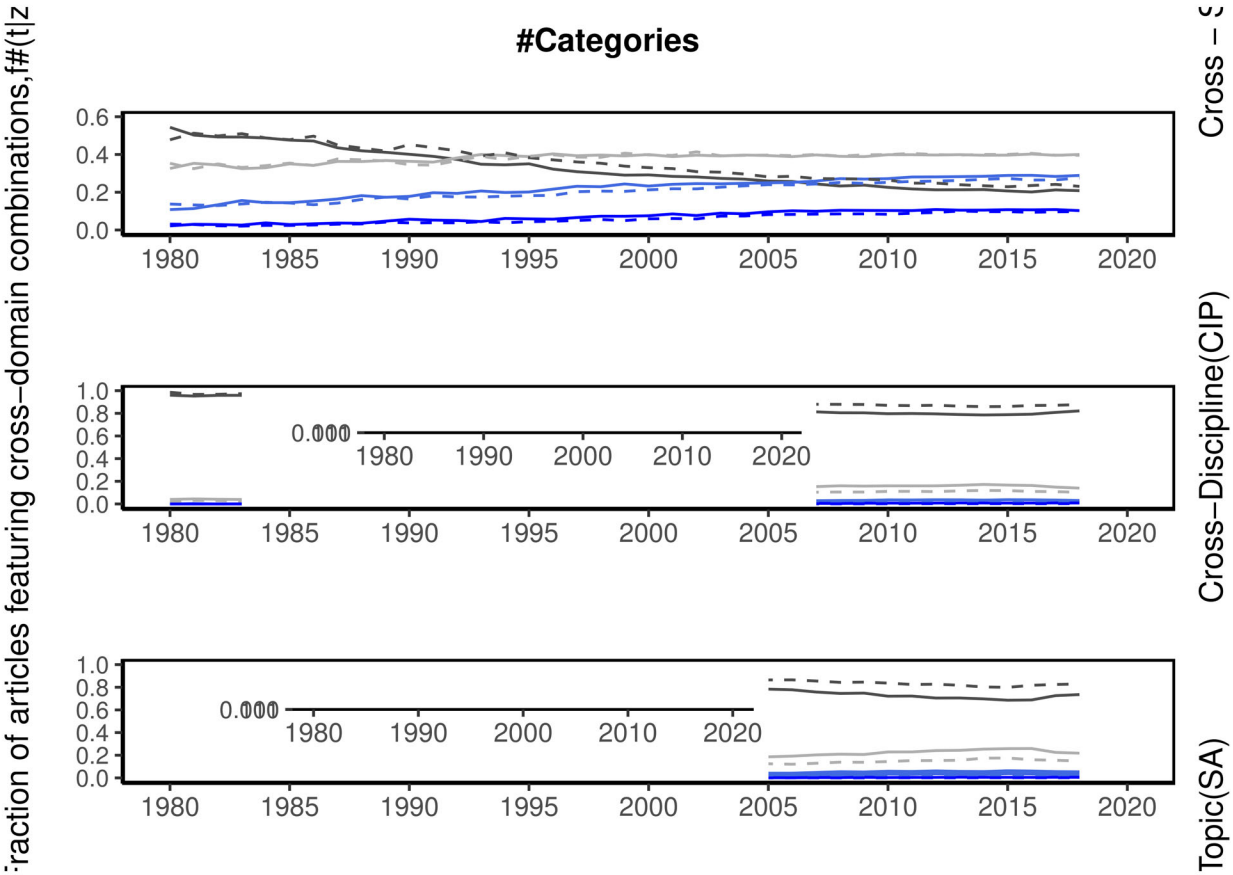
```
## Warning: Removed 39 row(s) containing missing values (geom_path).
```

```
## Warning: Removed 16 row(s) containing missing values (geom_path).
```

```
sce5+theme(legend.title = element_text(size=12, color = "salmon", face="bold"),
           legend.justification=c(0,1),
           legend.position=c(0.05, 0.95),
           legend.background = element_blank(),
           legend.key = element_blank()) +
  labs(subtitle="Cross-SA&CIP")+ylab("Fraction of articles featuring cross-domain combinations,f#(t|z)")
```




```
grid.arrange(arrangeGrob(e5 + theme(legend.position="none"),
                         ce5 + theme(legend.position="none"),
                         sce5 + theme(legend.position="none"),
                         nrow = 3,
                         top = textGrob("#Categories", vjust = 1, gp = gpar(fontface = "bold", cex = 1)),
                         left = textGrob("Fraction of articles featuring cross-domain combinations,f#(t
                         right = textGrob("Cross-Topic(SA)                Cross-Discipline(CIP)
```


#Categories
raction of articles featuring cross−domain combinations,f#(t|z
Cross − S
Cross−Discipline(CIP)
Topic(SA)
0.6
0.4
0.2
0.0
1.0
0.8
0.6
0.4
0.2
0.0
0.000
1980
1985
1990
1995
2000
2005
2010
2015
2020