

Data Creation and Cleaning

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Change from Previous Year

Create summary file

FY2022 Analysis - Methodology for Fiscal Futures

Code ▾

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```
library(tidyverse)
library(haven)
library(formatR)
library(lubridate)
library(smooth)
library(forecast)
library(scales)
library(kableExtra)
library(ggplot2)
library(readxl)
library(tidyverse)
library(data.table)
library(quantmod)
library(geofacet)
library(janitor)
```

```
knitr::opts_chunk$set(echo = TRUE, warning = FALSE, message = FALSE)
```

Data Creation and Cleaning

- Do the FOIA request. In a week or so, they send the expenditure and revenue data as excel files.
- Checks whether there are any new agencies, re-used funds etc. Create a list of funds, agencies, fund names, etc. for the new year and compare it to the immediate prior year to identify new funds.
- Update the funds_ab_in file which shows the use of funds. Use criteria to determine if the new funds should be in or out of the all-funds frame.
- Change the variable names to be consistent with other files such as AGENCYNAME → agency_name
- Once variable names are shared over all years of data, combine past years with newest year. All revenue files are in a revenue folder that I reference when I set the working directory. When adding new fiscal years, put the the newest year of data for revenue and expenditures in their respective folders.

Normally, when you receive the new fiscal year files from the Comptrollers office, you will need to change the variable names so that they are consistent with past years. This is an example of reading in the new file and changing the variable names. They seem to change almost every year in the file received from the FOIA so if the code breaks here, check to make sure that the columns you are trying to rename exist and are spelled correctly! Once variables are the same, you will want to save the file as a csv file in its Revenue/Expenditure file and bind all past years and the current year together in one dataframe.

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```

#Example code below: Read in excel file and rename columns so that it plays well with the other year
s' files.

revenue_fy22 <- read_xlsx("Fis_Fut_Rev_2022_Final.xlsx") %>%
  rename(fy = 'FY',
         fund = 'FUND',
         fund_name = 'FUND NAME',
         agency = 'AGENCY',
         agency_name = 'AGENCY NAME',
         source = 'REVENUE SOURCE',
         source_name = 'REV SRC NAME',
         receipts = 'AMOUNT'
  )

exp_fy22 <- read_xlsx("Fis_Fut_Exp_2022_Final.xlsx") %>%
  rename(fy = 'FY',
         fund = 'FUND',
         fund_name = 'FUND NAME',
         agency = 'AGENCY',
         agency_name = 'AGENCY NAME',
         appr_org = 'ORGANIZATION',
         org_name = 'ORGANIZATION NAME',
         obj_seq_type = 'APPROPRIATION',
         wh_approp_name = 'APPROPRIATION NAME',
         # exp_net_xfer = 'NET OF TRANS AMOUNT',
         expenditure = 'EXPENDED'
  )

# %>%
#   # these come from ioc_source file after merging
#   mutate(data_source = "exp IOC Aug 2022",
#         object = ,
#         seq = ,
#         type = ,
#         fund_cat = FIND_COLUMN, #create fund_cat column
#         fund_cat_name = FIND_NAME) # create fund_cat_name column

```

The code chunk below takes the .dta files for all fiscal years before FY 2022 and binds them together. Variable names were manually changed by past researchers so that they were consistent across years.

For FY 2023 and after, .dta files can be avoided entirely and .csv or excel files will be used. All files before this year had been saved and passed on as .dta files for Stata code before the transition to R in Fall 2022. For years after fy22: add line of code to bind csv files after binding the dta files together. Variable names must identical to merge files together.

Code below reads in the csv files created in chunks above (allrevfiles.csv and allexpfiles.csv). These files contain all years of data combined into one file BEFORE any recoding is done. Do not use this file for summing categories because it is just an inbetween step before recoding revenue and expenditure categories.

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```

# combined in past chunks called create-rev-csv and create-exp-csv

allrevfiles22 <- read_csv("allrevfiles22.csv") #combined but not recoded
allexpfiles22 <- read_csv("allexpfiles22.csv") #combined but not recoded

```

Inspecting new FY22 data files

Data files for closed years have been obtained from IOC. The numbers of funds, agencies, organizations, and revenue sources below were found by using pivot tables in the codebook files in the FY2022 Box folder. This could also be done using R and grouping new files by fund, agency, source number, source names, etc..

Revenue File:

- 684 Fund Numbers
- 80 Agencies
- 1184 Revenue source numbers - 1156 revenue source names

Expenditure File:

- 708 Fund Numbers
- 107 Agencies
- 98 Organization Numbers
- 313 Organization names

Finding new agencies and funds

General steps:

1. Identify new and reused funds for newest fiscal year. 2. Recode funds to take into account different fund numbers/names over the years. See Recoding New and Reused Funds for code chunk that does this. 3. Update fund_ab_in_2022.xlsx with any changes from previous fiscal year.

New Agencies, Funds, and Organizations from Expenditure files:

- Using the code below, I found 2 agencies, multiple funds, and a couple organizations that had not been specifically mentioned in the funds_ab_in file - AWM, FY2022.
 - Note: One new org name and org number combo has an expenditure of \$600 million for pensions payment. Investigate later.

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```
allrevfiles22 <- read_csv("allrevfiles22.csv") #combined but not recoded
allexpfiles22 <- read_csv("allexpfiles22.csv") #combined but not recoded

##### From Expenditure Data #####
# agencies referenced in any year before 2020:
agencies_past <- allexpfiles22 %>% filter(fy < 2022) %>% mutate(agency == as.character(agency)) %>% group_by(agency, agency_name) %>% unique() %>% summarize(expenditure = sum(expenditure, na.rm = TRUE)) %>% drop_na() %>% arrange(agency)
# agencies_past # 146 agencies ever

# agencies in 2022 data:
agencies22 <- allexpfiles22 %>% filter(fy == 2022) %>% mutate(agency == as.character(agency)) %>% group_by(agency, agency_name) %>% summarize(expenditure = sum(expenditure, na.rm = TRUE))
# agencies22 # 107 agencies this year

# 280 and 533 are new agency codes:
anti_join(agencies22, agencies_past, by = c("agency", "agency_name")) %>% arrange(agency)
```

agency	agency_name	expenditure
	<dbl> <chr>	<dbl>
280	COURTS COMMISSION	37746.77
533	COMM ON EQUITY & INCLUSION	1374653.51
2 rows		

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```
funds_past <- allexpfiles22 %>% filter(fy < 2022) %>% mutate(fund == as.character(fund)) %>% group_by(fund, fund_name) %>% summarize(count = n(), Expenditure = sum(expenditure, na.rm = TRUE)) %>% drop_na()
```

```
funds22 <- allexpfiles22 %>% filter(fy == 2022) %>% mutate(fund == as.character(fund)) %>% group_by(fund, fund_name) %>% summarize(count = n(), Expenditure = sum(expenditure, na.rm = TRUE)) %>% unique()
```

15 funds were in FY22 data that were not in past data:

```
anti_join(funds22, funds_past, by = c("fund", "fund_name")) %>% arrange(fund)
```

fund	fund_name	count	Expenditure
<chr>	<chr>	<int>	<dbl>
0110	DEV. DISABILITIES AWARENESS	1	0.0
0319	PENSION STABILIZATION	10	3000000000.0
0351	FREEDOM SCHOOLS	1	0.0
0367	CAP FACILITY TEC MODERNIZATION	2	1000000.0
0392	EQUAL PAY REGISTRATION	1	0.0
0393	SICKLE CELL CHRONIC DISEASE	1	0.0
0422	ELECTRIC VEHICLE REBATE	3	224908.5
0427	ENERGY TRANSITION ASSISTANCE	8	6046483.2
0461	PARITY ADVANCEMENT	1	0.0
0544	DOIT SPECIAL PROJECTS	3	9998631.5

1-10 of 15 rows

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```

# orgs_pastin the past = 916 org groups ever
orgs_past <- allexpfiles22 %>% filter(fy < 2022) %>% mutate(appr_org == as.character(appr_org)) %>%
  group_by(appr_org, org_name) %>% unique() %>% summarize(Expenditure = sum(expenditure, na.rm = TRUE))
) %>% drop_na()

# orgs_past # 916 org groups ever
orgs22 <- allexpfiles22 %>% filter(fy == 2022) %>% mutate(appr_org = as.character(appr_org)) %>% gro
up_by(appr_org, org_name) %>% summarize(Expenditure = sum(expenditure, na.rm = TRUE))
# orgs22 # 396 org groups this year

# 4 org number and org name combos are new for FY2022:
anti_join(orgs22, orgs_past, by = c("appr_org", "org_name")) %>% arrange(appr_org)

```

appr_org	org_name	Expenditure
<chr>	<chr>	<dbl>
05	PAROLE	51493444.12
06	RE-ENTRY SERVICES	17182773.70
25	RETIREMENT SYSTEM PMT ADMIN	6000000000.00
34	IL CRIMINAL JUSTICE INFO AUTH	55659.04
4 rows		

New Revenue Funds, Sources, and New Agencies:

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From Revenue Data

```

# agencies_past # 108 agencies ever
agencies_past <- allrevfiles22 %>% filter(fy < 2022) %>% mutate(agency == as.character(agency)) %>%
  group_by(agency, agency_name) %>% unique() %>% summarize(Receipts = sum(receipts, na.rm = TRUE)) %>%
drop_na()

# agencies22 # 80 agencies this year
agencies22 <- allrevfiles22 %>% filter(fy == 2022) %>% mutate(agency == as.character(agency)) %>% gr
oup_by(agency, agency_name) %>% summarize(Receipts = sum(receipts, na.rm = TRUE))

# 0 new agencies in revenue data this year
anti_join(agencies22, agencies_past, by = c("agency", "agency_name")) %>% arrange(agency)

```

0 rows

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```

funds_past <- allrevfiles22 %>% filter(fy < 2022) %>% mutate(fund == as.character(fund)) %>% group_by(fund, fund_name) %>% summarize(count = n(), Receipts = sum(receipts, na.rm = TRUE)) %>% drop_na()

funds22 <- allrevfiles22 %>% filter(fy == 2022) %>% mutate(fund == as.character(fund)) %>% group_by(fund, fund_name) %>% summarize(count = n(), Receipts = sum(receipts, na.rm = TRUE)) %>% unique() %>% drop_na()

# 19 revenue funds were in FY22 revenue data that were not in past data
# some could be small fund name changes
anti_join(funds22, funds_past, by = c("fund", "fund_name")) %>% arrange(fund)

```

fund	fund_name	count	Receipts
<chr>	<chr>	<int>	<dbl>
0165	RONALD MCDONALD HOUSE CHARITY	1	1.438928e+05
0319	PENSION STABILIZATION	1	3.000000e+08
0351	FREEDOM SCHOOLS	1	1.700000e+07
0367	CAP FACILITY TEC MODERNIZATION	1	5.300000e+06
0392	EQUAL PAY REGISTRATION	1	2.415000e+04
0422	ELECTRIC VEHICLE REBATE	3	1.352880e+07
0427	ENERGY TRANSITION ASSISTANCE	1	2.877307e+07
0544	DOIT SPECIAL PROJECTS	2	9.998632e+06
0628	ESSENTIAL GOVT SERV SUPPORT	1	1.000000e+09
0634	STATE TREASURER'S CAPITAL	2	2.731917e+05

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```

sources_past <- allrevfiles22 %>% filter(fy < 2022) %>% mutate(source == as.character(source)) %>% group_by(source, source_name) %>% summarize(count = n(), Receipts = sum(receipts, na.rm = TRUE)) %>% drop_na()

sources22 <- allrevfiles22 %>% filter(fy == 2022) %>% mutate(source == as.character(source)) %>% group_by(source, source_name) %>% summarize(count = n(), Receipts = sum(receipts, na.rm = TRUE)) %>% unique()

# 20 revenue sources were in FY22 data that were not in past data
# some could be small source name changes:
anti_join(sources22, sources_past, by = c("source", "source_name")) %>% arrange(source)

```

source	source_name	count	Receipts
<chr>	<chr>	<int>	<dbl>
0303	LOTTERY-ILOTTERY SETTLEMENT	1	177417302.14
2292	VIDEO TERMINAL TAX	3	893824161.56

source	source_name	count	Receipts
<chr>	<chr>	<int>	<dbl>
2457	E ST LOUIS FINANCE AUTH	1	41666.67
2590	ALTON CENTER BUSINESS PARK	1	291666.69
2611	E-PAY ADMINISTRATION FEES	1	1136120.58
2660	CONCESSION REVENUE-FOOD	1	17210.04
2682	SW BADGE REPLACEMENT FEES	1	10.00
2699	RB RECONCILIATION FEE	1	15000000.00
2729	NORTH PARK COLLEGE LIC PLATES	1	20.00
2736	STATE ST INSTITNL US GOV FND	1	1622448.06

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Sources 2737 through 2756 were not found in the IOC_source file so I added them. They do NOT have a rev_type until the Fiscal Futures researchers discuss which revenue type the sources fall under and if they should be included in the analysis in general.

Recoding New and Reused Funds

New funds will need to be manually added to the funds_ab_in excel file and determined if they should or should not be included in Fiscal Future calculations. **Copy info from word file here on how to add funds to excel file.**

- For funds that were reused once, a 9 replaces the 0 as the first digit. If reused twice, then the first two values are 10.
- Ex. 0350 → 9350 because its use changed.
 - Ex. 0367 becomes 10367 because its use has changed twice now. There was fund 0367 originally, then its use changed and it was recoded as 9367, and now it changed again so it is a 10367.
 - Excel file also has alternative ways to name funds (e.g. 0397-A and 0397-B) and variables for the year that the fund stopped being used. These have not been updated consistently over the years but it is useful information when trying to find any coding mistakes from the past.

New or reused funds revenue file recoding:

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```

# if first character is a 0, replace with a 9 if its purpose has changed

rev_1998_2022 <- allrevfiles22 %>%
  mutate(fund = ifelse(fy < 2002 & fund %in% c("0730", "0241", "0350", "0367", "0381", "0382", "0526", "0603", "0734", "0913", "0379"), str_replace(fund, "0","9"), fund)) %>%

  mutate(fund = ifelse(fy < 2008 & fund %in% c("0027", "0033", "0037", "0058", "0062", "0066", "0075", "0083", "0116", "0119", "0120", "0122", "0148", "0149", "0157", "0158", "0166", "0194", "0201", "0209", "0211", "0217", "0223", "0231", "0234", "0253", "0320", "0503", "0505", "0512", "0516", "0531", "0532", "0533", "0547", "0563", "0579", "0591", "0606", "0616", "0624", "0659", "0662", "0665", "0676", "0710", "0068", "0076", "0115", "0119", "0168", "0182", "0199", "0241", "0307", "0506", "0509", "0513"), str_replace(fund, "0","9"), fund)) %>%

  mutate(fund = ifelse(fy < 2016 & fund %in% c("0263", "0399", "0409"), str_replace(fund, "0","9"), fund)) %>%

  mutate(fund = ifelse(fy < 2017 & fund == "0364", str_replace(fund, "0","9"), fund)) %>%

  mutate(fund = ifelse(fy < 2018 & fund %in% c("0818", "0767", "0671", "0593", "0578"), str_replace(fund, "0","9"), fund)) %>%

  mutate(fund = ifelse(fy>1999 & fy < 2018 & fund == "0231", "10231", fund) ) %>%

  mutate(fund = ifelse(fy < 2019 & fund %in% c("0161", "0489", "0500", "0612", "0893", "0766"), str_replace(fund, "0","9"), fund)) %>%

  mutate(fund = ifelse(fy < 2020 & fund %in% c("0254", "0304", "0324", "0610", "0887", "0908", "0939", "0968"), str_replace(fund, "0","9"), fund)) %>%

  mutate(fund = ifelse(fy < 2021 & fund %in% c("0255", "0325", "0348", "0967", "0972"), str_replace(fund, "0","9"), fund)) %>%

#2022 changes
  mutate(fund = ifelse(fy < 2022 & fund %in% c("0110","0165","0351", "0392", "0393", "0422", "0544", "0628", "0634", "0656", "0672", "0683", "0723", "0742", "0743"), str_replace(fund, "0","9"), as.character(fund))) %>% # replaces first 0 it finds with a 9
  mutate(fund = ifelse(fy < 2022 & fund == "0367", "10367", as.character(fund)) # fund reused for 3rd time
)

```

Expenditure recoding:

[Hide](#)

```

# if first character is a 0, replace with a 9

exp_1998_2022 <- allexpfiles22 %>%
  mutate(fund = ifelse(fy < 2002 & fund %in% c("0730", "0241", "0350", "0367", "0381", "0382", "0526", "0603", "0734", "0913", "0379"), str_replace(fund, "0","9"), fund)) %>%

  mutate(fund = ifelse(fy < 2008 & fund %in% c("0027", "0033", "0037", "0058", "0062", "0066", "0075", "0083", "0116", "0119", "0120", "0122", "0148", "0149", "0157", "0158", "0166", "0194", "0201", "0209", "0211", "0217", "0223", "0231", "0234", "0253", "0320", "0503", "0505", "0512", "0516", "0531", "0532", "0533", "0547", "0563", "0579", "0591", "0606", "0616", "0624", "0659", "0662", "0665", "0676", "0710", "0068", "0076", "0115", "0119", "0168", "0182", "0199", "0241", "0307", "0506", "0509", "0513"), str_replace(fund, "0","9"), fund)) %>%

  mutate(fund = ifelse(fy < 2016 & fund %in% c("0263", "0399", "0409"), str_replace(fund, "0","9"), fund)) %>%

  mutate(fund = ifelse(fy < 2017 & fund == "0364", str_replace(fund, "0","9"), fund)) %>%

  mutate(fund = ifelse(fy < 2018 & fund %in% c("0818", "0767", "0671", "0593", "0578"), str_replace(fund, "0","9"), fund)) %>%
  mutate(fund = ifelse(fy>1999 & fy < 2018 & fund == "0231", "10231", fund) ) %>%

  mutate(fund = ifelse(fy < 2019 & fund %in% c("0161", "0489", "0500", "0612", "0893", "0766"), str_replace(fund, "0","9"), fund)) %>%

  mutate(fund = ifelse(fy < 2020 & fund %in% c("0254", "0304", "0324", "0610", "0887", "0908", "0939", "0968"), str_replace(fund, "0","9"), fund)) %>%

  mutate(fund = ifelse(fy < 2021 & fund %in% c("0255", "0325", "0348", "0967", "0972"), str_replace(fund, "0","9"), fund)) %>%

#2022 changes
  mutate(fund = ifelse(fy < 2022 & fund %in% c("0110","0165","0351", "0392", "0393", "0422", "0544", "0628", "0634", "0656", "0672", "0683","0723", "0742", "0743"), str_replace(fund, "0","9"), as.character(fund))) %>% # replaces first 0 it finds with a 9
  mutate(fund = ifelse(fy < 2022 & fund == "0367", "10367", as.character(fund)) # fund reused for 3rd time
  )

```

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```

funds_ab_in_2022 = readxl::read_excel("C:/Users/aleaw/OneDrive/Documents/PhD Fall 2021 - Spring 2022/Merriman RA/Fiscal Futures FY2022/Replication-Files/funds_ab_in_2022.xlsx")

exp_temp <- exp_1998_2022 %>%
  arrange(fund, fy) %>%
  filter(expenditure != 0) %>% # keeps everything that is not zero
# join funds_ab_in_2021 to exp_temp
  left_join(funds_ab_in_2022, by = "fund") # matches most recent fund number

```

- the initial combined years of data are saved as dataframes named `exp_1998_2022` and `rev_1998_2022`. These are then saved as `exp_temp` and `rev_temp` while recoding variables. This is BEFORE category groups are created and cleaned below. `exp_temp` and `rev_temp` are only temporary files; do not use for aggregating totals yet!

Update Agencies: Early agencies replaced by successors

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```
# recodes old agency numbers to consistent agency number
exp_temp <- exp_temp %>%
  mutate(agency = case_when(
    (agency=="438" | agency=="475" | agency == "505") ~ "440",
    # financial institution & professional regulation &
    # banks and real estate --> coded as financial and professional reg
    agency == "473" ~ "588", # nuclear safety moved into IEMA
    (agency == "531" | agency == "577") ~ "532", # coded as EPA
    (agency == "556" | agency == "538") ~ "406", # coded as agriculture
    agency == "560" ~ "592", # IL finance authority (fire trucks and agriculture stuff)to state fire
    marshal
    agency == "570" & fund == "0011" ~ "494", # city of Chicago road fund to transportation
    TRUE ~ (as.character(agency))))
```

Modify Expenditure File

Tax refunds

Aggregate expenditures: Save tax refunds as negative revenue. Code refunds to match the `rev_type` codes (02=income taxes, 03 = corporate income taxes, 06=sales tax, 09=motor fuel tax, 24=insurance taxes and fees, 35 = all other tax refunds).

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```
## negative revenue becomes tax refunds
```

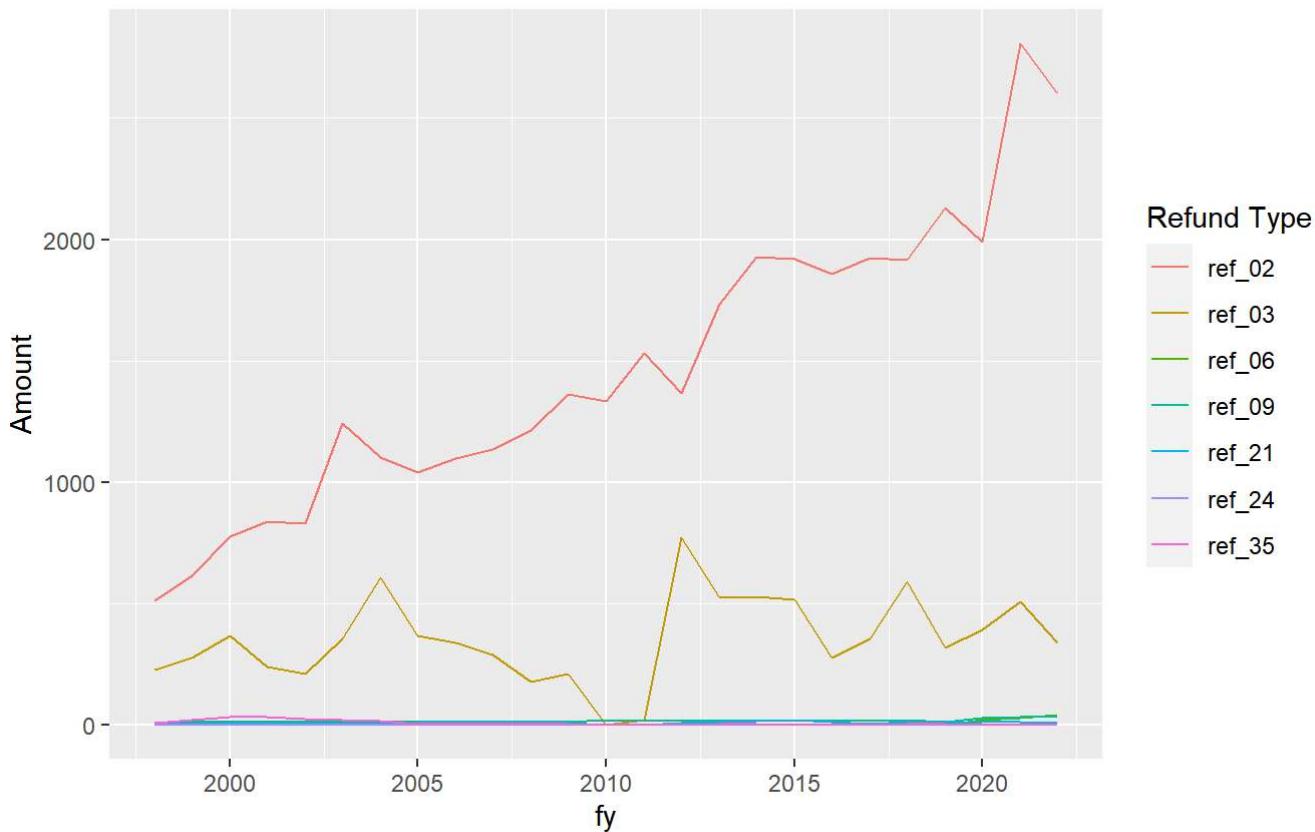
```
tax_refund_long <- exp_temp %>% # fund != "0401" # removes State Trust Funds
  filter(fund != "0401" & (object=="9910" | object=="9921" | object=="9923" | object=="9925")) %>%
    # keeps these objects which represent revenue, insurance, treasurer, and financial and professional
    # reg tax refunds
    mutate(refund = case_when(
      fund=="0278" & sequence == "00" ~ "02", # for income tax refund
      fund=="0278" & sequence == "01" ~ "03", # tax administration and enforcement and tax operations become corporate income tax refund
      fund == "0278" & sequence == "02" ~ "02",
      object=="9921" ~ "21", # inheritance tax and estate tax refund appropriation
      object=="9923" ~ "09", # motor fuel tax refunds
      obj_seq_type == "99250055" ~ "06", # sales tax refund
      fund=="0378" & object=="9925" ~ "24", # insurance privilege tax refund
      fund=="0001" & object=="9925" ~ "35", # all other taxes
      T ~ "CHECK")) # if none of the items above apply to the observations, then code them as CHECK
```

```
exp_temp <- left_join(exp_temp, tax_refund_long) %>%
  mutate(refund = ifelse(is.na(refund), "not refund", as.character(refund)))
```

```
tax_refund <- tax_refund_long %>%
  group_by(refund, fy)%>%
  summarize(refund_amount = sum(expenditure, na.rm = TRUE)/1000000) %>%
  pivot_wider(names_from = refund, values_from = refund_amount, names_prefix = "ref_") %>%
  mutate_all(~replace_na(., 0)) %>%
  arrange(fy)
```

```
tax_refund %>% pivot_longer( ref_02:ref_35, names_to = "Refund Type", values_to = "Amount") %>%
  ggplot()+
  geom_line(aes(x=fy,y=Amount, group = `Refund Type`, color = `Refund Type`))+ 
  labs(title = "Refund Types", caption = "Refunds are excluded from Expenditure totals and instead subtracted from Revenue totals") +
  labs(title = "Tax refunds",
       caption = "Rev_type codes: 02=income taxes, 03=corporate income taxes, 06=sales tax, 09=motor fuel tax,
       24=insurance taxes and fees, 35 = all other tax refunds." )
```

Tax refunds



Rev_type codes: 02=income taxes, 03=corporate income taxes, 06=sales tax, 09=motor fuel tax, 24=insurance taxes and fees, 35 = all other tax refunds.

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```
# remove the items we recoded in tax_refund_Long  
exp_temp <- exp_temp %>% filter(refund == "not refund")
```

tax_refund amounts are removed from expenditure totals and instead subtracted from revenue totals (since they were tax refunds).

Pension Expenditures

300 million pension stabilization payment from fund 0319, object == 1900 for lump sums and other purposes. This is a type of pension contribution, right?

State payments to the following pension systems:

- Teachers Retirement System (TRS)
- New POB bond in 2019: Accelerated Bond Fund paid benefits in advance as lump sum
- State Employee Retirement System (SERS)
- State University Retirement System (SURS)
- Judges Retirement System (JRS)
- General Assembly Retirement System (GARS)

Employer contributions for pensions are excluded from analysis to avoid double counting the cost of pensions.

Expenditures with object 4430 for pensions, benefits, and annuities appears in items from funds 0473, 0477, 0479, 0481, (TRS, JRS, SERS, GARS), 0755, 0786, 0787, 0788, 0789 (deferred compensation plan, GAR excess benefit, JRS excess benefit, SER excess benefit, TRS excess benefit) are NOT included in the analysis. All are coded with

in_ff=0 in the fund_ab_in.xlsx file of funds. - Some expenditures with object=4430 are paid for with Pension obligation bond funds (fund == 0825). In past years, some POB funded expenditures were moved to revenue side. We are no longer doing this as of FY2021.

State pension contributions are largely captured with object=4431. (**State payments into pension fund**)

- includes 8 billion payment in 2004 that creates large peak in expenditure graphs

Other items to be aware of that may contain useful pension context:

- object = 1298 is for Purchase of Investments and is excluded from analysis except for a couple exceptions during 2010 and 2011.

- object = 1900 for pension stabilization under lump sums

- object = 1167 and 1168 is for Employer pension contributions but is not used as of FY2022.

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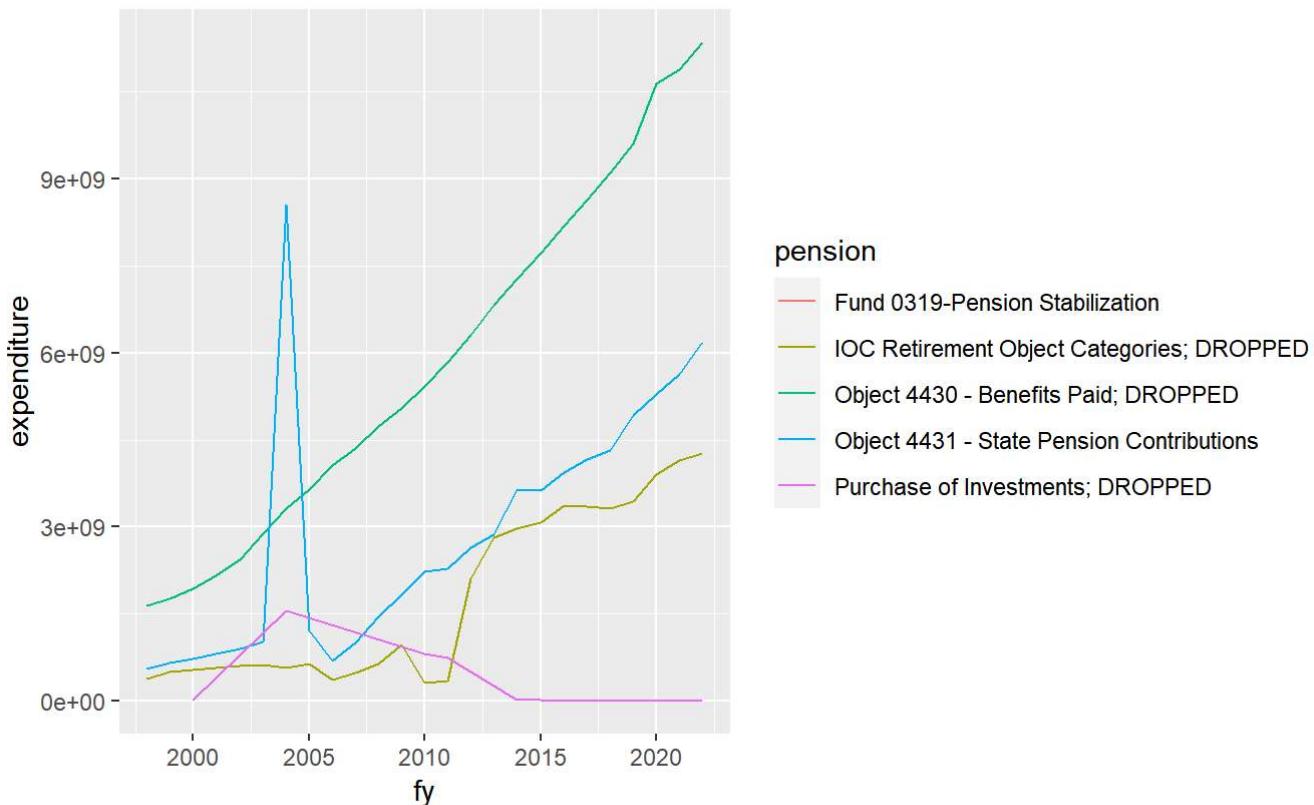
```
# check what is being included in pensions

pension_check <- exp_temp %>%
  mutate(pension = case_when(
    (object=="4430") ~ "Object 4430 - Benefits Paid; DROPPED", # pensions, annuities, benefits
    (object=="4431") ~ "Object 4431 - State Pension Contributions", # 4431 = state payments into pension fund
    (obj_seq_type > "11590000" & obj_seq_type < "11660000") ~ "IOC Retirement Object Categories; DROPPED",
    # objects 1159 to 1166 are all considered Retirement by Comptroller
    TRUE ~ "0")) %>% # ALL other observations coded as 0 for non-pension items

# recodes specific instances of code anomalies from past years:
mutate(pension = case_when(
  # judges retirement "Purchase of investments" in 2010 and 2011
  (object=="1298" &
    #(fy==2010 | fy==2011) &
    (fund=="0477" | fund=="0479" | fund=="0481")) ~ "Purchase of Investments; DROPPED",
  # pension stabilization fund in 2022
  object == "1900" & fund == "0319" ~ "Fund 0319-Pension Stabilization",
  TRUE ~ as.character(pension)) ) %>%
  filter(pension != "0" )

pension_check %>% group_by(fy, pension) %>%
  summarize(expenditure = sum(expenditure, na.rm = TRUE)) %>%
  ggplot(aes(x=fy, y = expenditure, color = pension)) +
  geom_line() +
  labs (title = "Pension Fund Payments In and Retirement Benefits Out",
        caption = "Shows items from objects 4430 as employer pension expenditures (retirement benefits paid).
Object = 4431 includes state payments INTO pension Fund.")
```

Pension Fund Payments In and Retirement Benefits Out



Shows items from objects 4430 as employer pension expenditures (retirement benefits paid).
Object = 4431 includes state payments INTO pension Fund.

[Hide](#)

```

pension_check2 <- exp_temp %>%
  mutate(pension = case_when(
    # (object=="4431" | (object>"1159" & object<"1166") ) ~ 1,
    (object=="4431" ) ~ 1, # 4431 = payments into pension fund
    (obj_seq_type > "11590000" & obj_seq_type < "11660000") ~ 2,
    # objects 1159 to 1166 are all considered Retirement by Comptroller
    # object == 1167 also appears to be Other Retirement but isn't used yet
    TRUE ~ 0)) %>%

  mutate(pension = case_when(      # objects were weird for 2010 and 2011
    (object=="4431" & fund=="0473") ~ 3, # teachers retirement system,
    # obj_seq_type == "44310055" ~ 3, # teachers retirement system in 2010 and 2011.
    (object=="1298" &
      #(fy==2010 | fy==2011) & # for the two weird years based on past code
      (fund=="0477" | fund=="0479" | fund=="0481")) ~ 3, # judges retirement
    # obj_seq_type == "12980055" ~ 3, # judge retirement contributions during 2010 and 2011
    object == "1900" & fund == "0319" ~ 5, # pension stabilization fund in 2022
    TRUE ~ pension)) %>%
  filter(pension > 0 )

#write_csv(pension_check, "pension_checkfy22v3.csv")

## taking care of Pension Obligation Bond proceeds

pension_check2 <- pension_check2 %>%
  # change object for 2010 and 2011, retirement expenditures were bond proceeds
  mutate(object = ifelse((pension == 3 & in_ff == "0"), "4431", as.character(object))) %>% # changes
  weird teacher & judge retirement system pensions object to normal pension object 4431
  mutate(pension = ifelse(pension == 1 & in_ff == "0", 2, pension)) %>% # coded as 2 if it was supposed to be excluded due to being bond proceeds ?
  mutate(in_ff = ifelse((pension ==2 | pension ==3), "1", as.character(in_ff)))

# create file with all pension items to find any mistakes
#pension_check %>% write_csv("all_pensions.csv")

table(pension_check2$pension)

```

```

##  

##   1   2   3   5  

## 226 8737   22   5

```

object==4431 + employee contributions rev should roughly equal object==4430 benefits being paid.

Modify exp_temp and move all state pension contributions to their own group (901):

[Hide](#)

```

exp_temp <- exp_temp %>%
  arrange(fund) %>%
  mutate(pension = case_when(
    # objects were weird for 2010 and 2011 for teacher and judge retirement system
    # (object=="4431" & fund=="0473") ~ 3, # teachers retirement system,
    # Was this: (object=="4431" & fund=="0473" & (fy==2010 | fy==2011)) ~ 3, # teachers retirement system,
    (object=="4431") ~ 1, # 4431 = easy to find pension payments INTO fund

    (object>"1159" & object<"1166") & fund != "0183" & fund != "0193" ~ 2,
    # objects 1159 to 1166 are all considered Retirement by Comptroller, OUT
    # object == 1167 also appears to be Other Retirement but isn't used yet

    (object=="1298" & # Purchase of Investments
     (fy==2010 | fy==2011) &
     (fund=="0477" | fund=="0479" | fund=="0481")) ~ 3, #judges retirement OUT of fund

    fund == "0319" ~ 4, #pension stabilization fund IN?
    TRUE ~ 0) )

```

table(exp_temp\$pension) # same number of total observations > 0 as pension_check

```

## 
##      0      1      2      3      4
## 159004    228   8719      6      5

```

Description of Pension Obligation Acceleration Bond at this link
<https://www.ilga.gov/legislation/ilcs/documents/003003300K7.7.htm>

[Hide](#)

```

# special accounting of pension obligation bond (POB)-funded contributions to JRS, SERS, GARS, TRS

exp_temp <- exp_temp %>%
  # change object for 2010 and 2011, retirement expenditures were bond proceeds
  mutate(object = ifelse((pension >0 & in_ff == "0"), "4431", object)) %>%
  # changes weird teacher & judge retirement system pensions object to normal pension object 4431
  mutate(pension = ifelse(pension >0 & in_ff == "0", 6, pension)) %>% # coded as 6 if it was supposed to be excluded.
  mutate(in_ff = ifelse(pension>0, "1", in_ff))

table(exp_temp$pension)

```

```

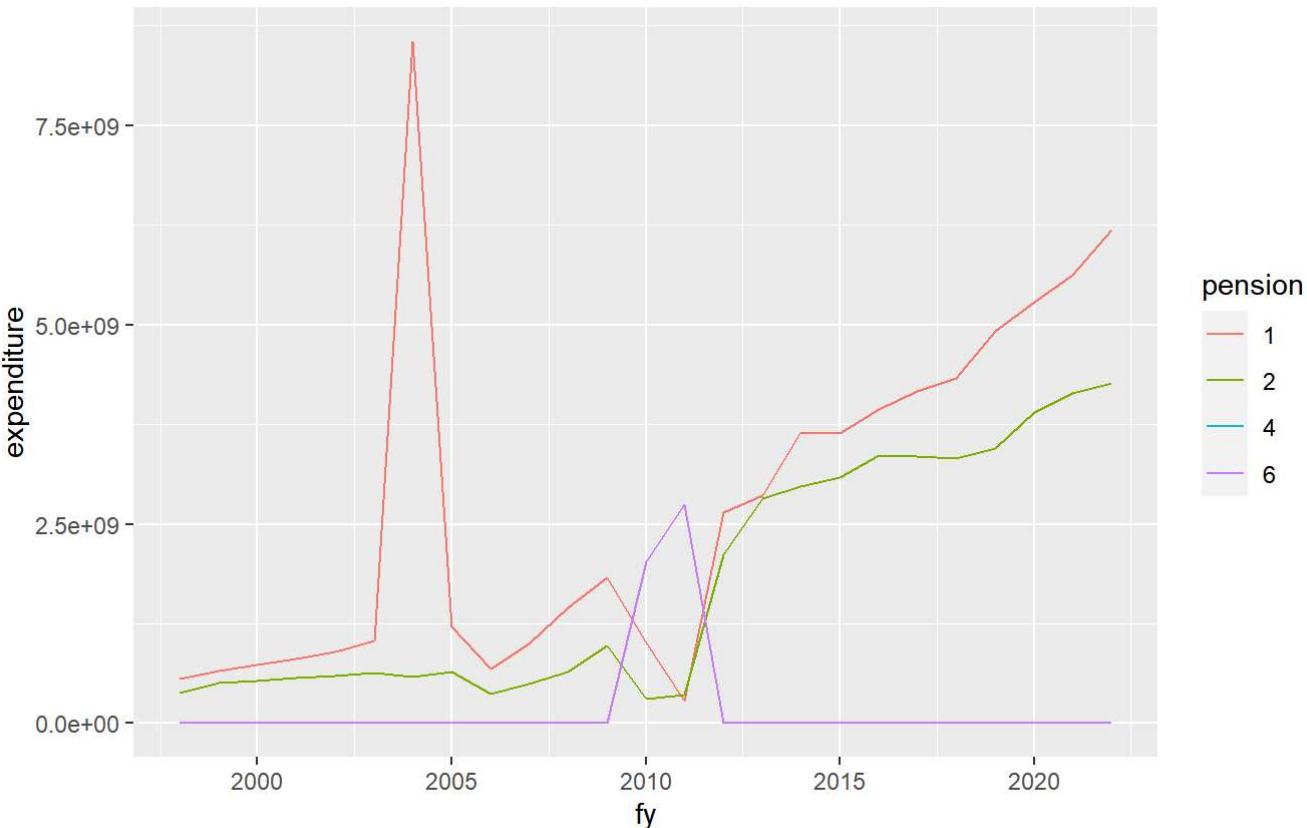
## 
##      0      1      2      4      6
## 159004    226   8586      5    141

```

[Hide](#)

```
# all other pensions objects  codes get agency code 901 for State Pension Contributions
exp_temp <- exp_temp %>%
  mutate(agency = ifelse(pension>0, "901", as.character(agency)),
         agency_name = ifelse(agency == "901", "State Pension Contributions", as.character(agency_name)))
  
exp_temp %>%
  filter(pension > 0) %>%
  mutate(pension = as.factor(pension)) %>%
  group_by(fy, pension) %>%
  summarize(expenditure = sum(expenditure, na.rm=TRUE)) %>%
  ggplot(aes(x=fy, y=expenditure, color = pension)) +
  geom_line() +
  labs (title = "Pension Expenditures",
        caption = "Includes objects 1160-1165, 1298, 1900, and 4431 as pension expenditures.
Object = 4431 includes payments INTO pension Fund.")
```

Pension Expenditures



Includes objects 1160-1165, 1298, 1900, and 4431 as pension expenditures.
Object = 4431 includes payments INTO pension Fund.

Drop Interfund transfers

- object == 1993 is for interfund cash transfers
- agency == 799 is for statutory transfers
- object == 1298 is for purchase of investments and is not spending EXCEPT for pensions in 2010 and 2011 (and were recoded already to object == "4431"). Over 168,000 observations remain.

Hide

```

transfers_drop <- exp_temp %>% filter(
  agency == "799" | # statutory transfers
  object == "1993" | # interfund cash transfers
  object == "1298") # purchase of investments

exp_temp <- anti_join(exp_temp, transfers_drop)

#transfers_drop %>% group_by(fy) %>% summarize(expenditure = sum(expenditure)) %>% ggplot(aes(x=fy, y
=expenditure)) + geom_line() + labs(title = "Dropped Transfers", caption = "Includes statutory transfers, interfund cash transfers, and purchase of investments")

```

State employee healthcare costs

State Employee Health Care = Sum of expenditures for “health care coverage as elected by members per state employees group insurance act.” The payments are made from the Health Insurance Reserve Fund. We subtract the share that came from employee contributions. Employee contributions are not considered a revenue source or an expenditure in our analysis.

Fund = 0457 is “Group insurance premium”, in_ff = 1

Fund = 0193 is “Local govt health insurance reserve”, in_ff = 0

fund = 0477 is “Community College Health Insurance”, in_ff = 0.

- had large amount in early years

Fund = 0907 = health insurance reserve, in_ff = 1

Fund = 9939 is “group self-insurers’ insolv”, in_ff = 1

Fund = 0940 is Self-Insurers security, in_ff = 0

Fund = 0739 is Group Workers Comp Pool Insol, in_ff = 1

Employer contributions for group insurance are excluded to avoid double counting the cost of healthcare.

All employer contributions are coded as object = 1180.

- eehc = 0 means it is NOT a state healthcare cost but it is an employer contribution of some type to some fund
- eehc = 1 means it is a state employee healthcare cost and it is an employer contribution to health insurance

If observation is a group insurance contribution, then the expenditure amount is set to \$0 (essentially dropped from analysis).

[Hide](#)

```

# if observation is a group insurance contribution, then the expenditure amount is set to $0 (essentially dropped from analysis)
exp_temp <- exp_temp %>%
  mutate(eehc = ifelse(
    # group insurance contributions for 1998-2005 and 2013-present
    fund == "0001" & (object == "1180" | object == "1900") & agency == "416" & appr_org=="20", 0, 1) )%>%
  mutate(eehc = ifelse(
    # group insurance contributions for 2006-2012
    fund == "0001" & object == "1180" & agency == "478" & appr_org=="80", 0, eehc) )%>%
  # group insurance contributions from road fund
  # coded with 1900 for some reason??
  mutate(eehc = ifelse(
    fund == "0011" & object == "1900" & agency == "416" & appr_org=="20", 0, eehc) )%>%
  mutate(expenditure = ifelse(eehc=="0", 0, expenditure)) %>%

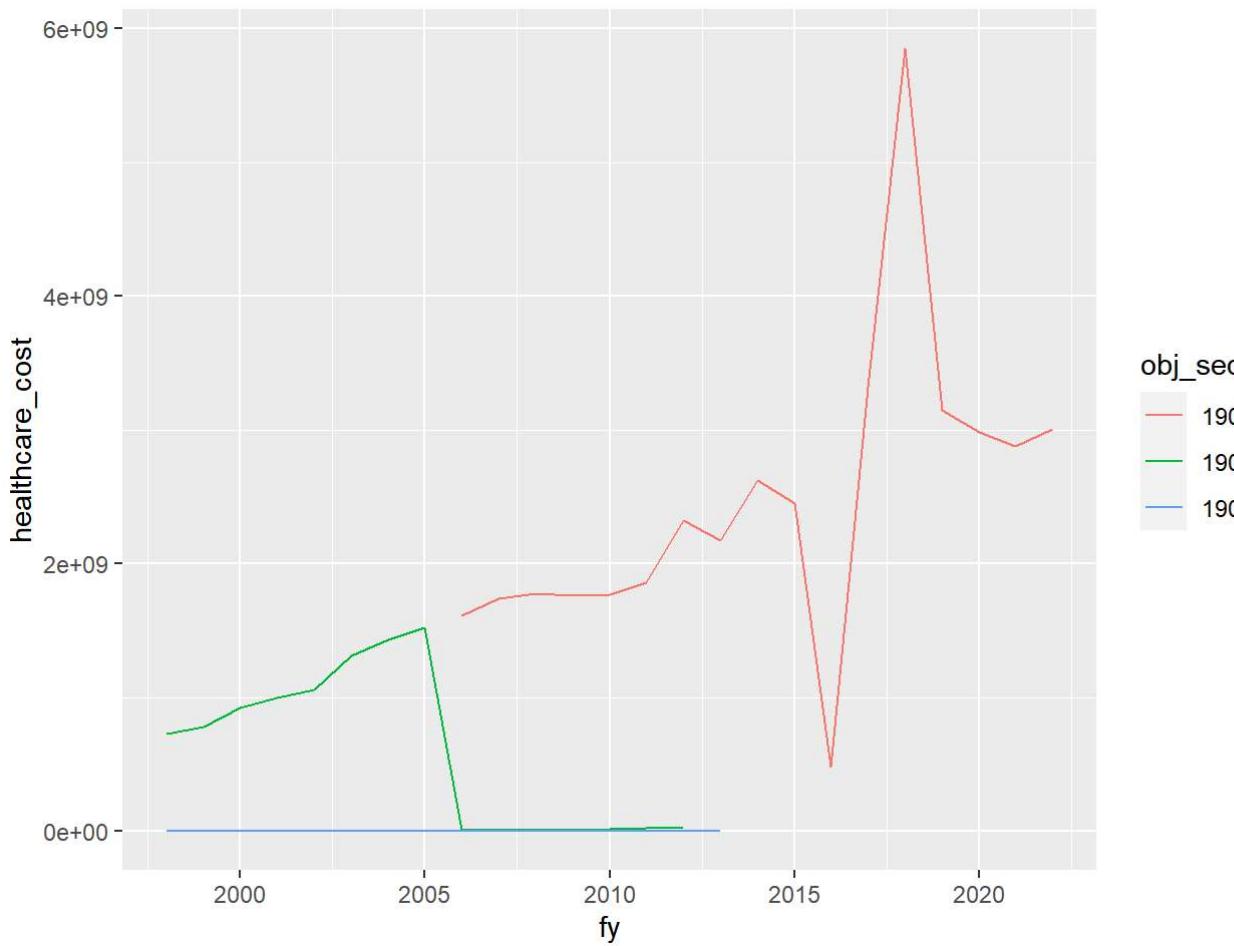
  mutate(agency = case_when(  # turns specific items into State Employee Healthcare (agency=904)
    fund=="0907" & (agency=="416" & appr_org=="20") ~ "904",   # central management Bureau of benefits using health insurance reserve
    fund=="0907" & (agency=="478" & appr_org=="80") ~ "904",   # agency = 478: healthcare & family services using health insurance reserve - stopped using this in 2012
    TRUE ~ as.character(agency))) %>%
  mutate(agency_name = ifelse(agency == "904", "STATE EMPLOYEE HEALTHCARE", as.character(agency_name)),
  in_ff = ifelse( agency == "904", 1, in_ff),
  group = ifelse(agency == "904", "904", as.character(agency))) # creates group variable

# Default group = agency number

healthcare_costs <- exp_temp %>% filter(group == "904")

healthcare_costs %>% group_by(fy,obj_seq_type) %>%
  summarise(healthcare_cost = sum(expenditure, na.rm = TRUE)) %>%
  ggplot() +geom_line(aes(x=fy, y=healthcare_cost, color = obj_seq_type))

```



[Hide](#)

```
exp_temp <- anti_join(exp_temp, healthcare_costs) %>% mutate(expenditure = ifelse(object == "1180", 0, expenditure))
```

```
healthcare_costs_yearly <- healthcare_costs %>% group_by(fy, group) %>% summarise(healthcare_cost = sum(expenditure, na.rm = TRUE)/1000000) %>% select(-group)
```

This code chunk above for dealing with group insurance means that healthcare costs need to be added to expenditures after other group names are assigned. Then employee contributions/insurance premiums from the revenue side need to be subtracted from the total cost of employee healthcare for the net cost.

Local Transfers

Separate transfers to local from parent agencies that come from DOR(492) or Transportation (494). Treats muni revenue transfers as expenditures, not negative revenue.

The share of certain taxes levied state-wide at a common rate and then transferred to local governments. (Purely local-option taxes levied by specific local governments with the state acting as collection agent are NOT included.)

The five corresponding revenue items are:

- Local share of Personal Income Tax
- Local share of General Sales Tax
- Personal Property Replacement Tax on Business Income

- Personal Property Replacement Tax on Public Utilities
- Local share of Motor Fuel Tax - Transportation Renewal Fund 0952

[Hide](#)

```
exp_temp <- exp_temp %>% mutate(
  agency = case_when(fund=="0515" & object=="4470" & type=="08" ~ "971", # income tax
                      fund=="0515" & object=="4491" & type=="08" & sequence=="00" ~ "971",
                      fund=="0802" & object=="4491" ~ "972", #pprt transfer
                      fund=="0515" & object=="4491" & type=="08" & sequence=="01" ~ "976", #gst to Loc
al
                      fund=="0627" & object=="4472"~ "976" ,
                      fund=="0648" & object=="4472" ~ "976",
                      fund=="0515" & object=="4470" & type=="00" ~ "976",
object== "4491" & (fund=="0188" | fund=="0189") ~ "976",
fund=="0187" & object=="4470" ~ "976",
fund=="0186" & object=="4470" ~ "976",
object=="4491" & (fund=="0413" | fund=="0414" | fund=="0415") ~ "975", #mft to local
fund == "0952"~ "975", # Added Sept 29 2022 AWM. Transportation Renewal MFT
TRUE ~ as.character(agency)),

agency_name = case_when(agency == "971"~ "INCOME TAX 1/10 TO LOCAL",
                       agency == "972" ~ "PPRT TRANSFER TO LOCAL",
                       agency == "976" ~ "GST TO LOCAL",
                       agency == "975" ~ "MFT TO LOCAL",
                       TRUE~as.character(agency_name)),
group = ifelse(agency>"970" & agency < "977", as.character(agency), as.character(group)))
```

table(exp_temp\$group)

```
##          101     102     103     105     107     108     109     110     112     115     120     131     140
##      583      3    240    155     89    193    137    129    162    128     17    386      7
##     155    156    167    201    210    275    280    285    290    295    310    330    340
##      75    117   118   1345     15    399      1   234    470   1185   213   205    819
##     350    360    370    402    406    416    418    420    422    425    426    427    440
##    4098   1738    803   1829   4660   3932   2420   10975   9668   1038   7614    779   3705
##     442    444    445    446    448    452    458    466    478    482    492    493    494
##     596  11357     23   1119     22    610    305    587   3063   5524   4129   1924   9550
##     497    503    506    507    509    510    511    517    520    524    525    526    527
##    2519    421     17   332     33     26   8954    128      5   1126     28   174     40
##     528    529    532    533    534    537    540    541    542    546    548    554    555
##    1838     18   5746      2      5   192     64   1305    174    873    264     26     25
##     557    558    559    562    563    564    565    567    568    569    571    574    575
##    208    280    245     19   699     17   198    176      2    450     65     80     85
##     576    578    579    580    583    585    586    587    588    589    590    591    592
##      1    233    438    327     21     43   5297   683   2681    597    166    188   1070
##    593    598    601    608    612    616    620    628    636    644    664    676    684
##    151     10    720    177    131    141     99    147    115    182    271    462    895
##    691    692    693    695    901    971    972    975    976
##    934    786      8   197   8958     25     25     84   1174
```

[Hide](#)

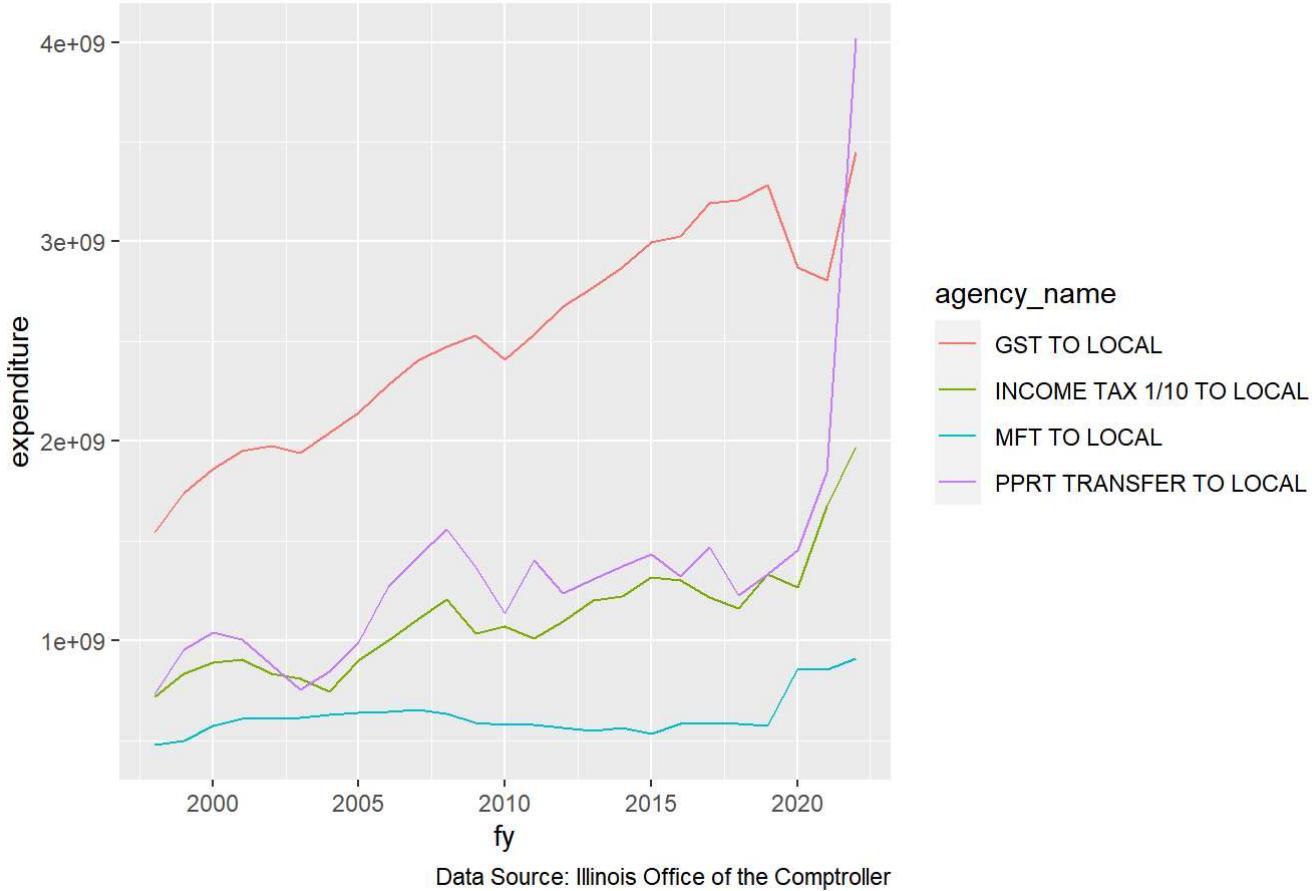
```

transfers_long <- exp_temp %>%
  filter(group == "971" | group == "972" | group == "975" | group == "976")

transfers_long %>%
  group_by(agency_name, group, fy) %>%
  summarize(expenditure = sum(expenditure, na.rm=TRUE) )%>%
  ggplot() + geom_line(aes(x=fy, y = expenditure, color=agency_name)) + labs(title = "Transfers to Local Governments", caption = "Data Source: Illinois Office of the Comptroller")

```

Transfers to Local Governments



[Hide](#)

```

transfers <- transfers_long %>%
  group_by(fy, group ) %>%
  summarize(sum_expenditure = sum(expenditure)/1000000) %>%
  pivot_wider(names_from = "group", values_from = "sum_expenditure", names_prefix = "exp_")

exp_temp <- anti_join(exp_temp, transfers_long)

dropped_inff_0 <- exp_temp %>% filter(in_ff == 0)

exp_temp <- exp_temp %>% filter(in_ff == 1) # drops in_ff = 0 funds AFTER dealing with net-revenue above

```

Debt Service

Debt Service expenditures include interest payment on both short-term and long-term debt. We do not include escrow or principal payments.

Decision from Sept 30 2022: We are no longer including short term principal payments as a cost; only interest on borrowing is a cost. Pre FY22 and the FY21 correction, we did include an escrow payment and principle payments as costs but not bond proceeds as revenues. This caused expenditures to be inflated because we were essentially counting debt twice - the principle payment and whatever the money was spent on in other expenditure categories, which was incorrect.

Logic: interest for long-term debt that likely funds capital projects.

Objects:

8813 interest **INCLUDE AS COST**

8811 is for principle **EXCLUDE from aggregate debt expenditure**

8841 is for escrow payments **EXCLUDE from aggregate debt expenditure**

8800 is for capital projects (Build Illinois Bonds, Civic Center, Tollway **EXCLUDE tollway in debt cost** - Note: debt principle and interest are both included in capital projects because they are combined in the data observations; bond proceeds are not considered a revenue source

Obj_seq_type:

- Exclude: Bond principle payments: obj_seq_type == 88110008
- Exclude: Short term borrowing principle: obj_seq_type == 88110108
- Include: General Obligation Bond Interest: obj_seq_type == 88130000 & 88130008
- Include: Interest on short-term borrowing: 88130108
- Exclude: Escrow payment == 88410008
- Include: Build IL Bonds principal AND interest
- Tollway is obj_seq_type == 88000055, filter out fund == 0455 to remove tollway
- fund == 0455 is the IL State Toll Highway fund, items mostly for operations and maintenance

Filtering for interest on short term borrowing and GO bonds (8813_ _ _ _) and GO bond principal amounts (88130008).

- object == 8813 is for interest but obj_seq_type is used just to be more specific below.

Hide

```
# GO bond principal and GO bond interest
GObond_debt <- exp_temp %>%
  filter(obj_seq_type == "88110008" | obj_seq_type == "88130000" | obj_seq_type == "88130008") %>%
  group_by(fy, obj_seq_type) %>%
  summarize(sum = sum(expenditure, na.rm=TRUE)) %>%
  pivot_wider(names_from = obj_seq_type, values_from = sum) %>%
  mutate(principal = `88110008`,
         interest = sum(`88130008`+`88130000`, na.rm = TRUE),
         ratio = (as.numeric(interest)/as.numeric(principal)))

GObond_debt %>% select(principal, interest, ratio) %>%
  mutate(across(principal:interest, ~format(., big.mark= ",", scientific = F)))
```

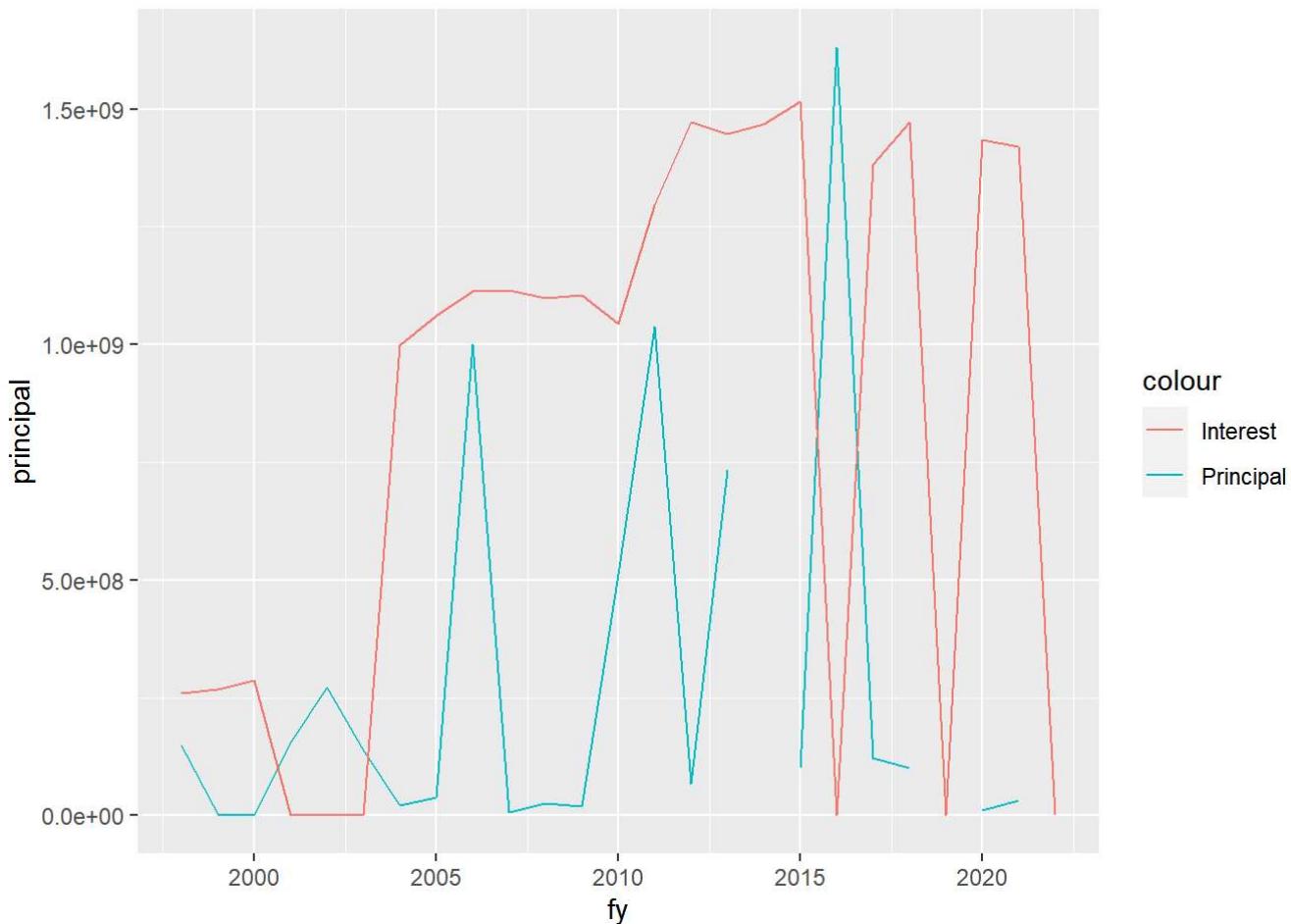
fy	principal	interest	ratio
	<dbl> <chr>	<chr>	<dbl>
1998	148,066,200	259,385,877	1.751824
1999	2,999,040	267,956,231	89.347335
2000	1,000,000	287,154,654	287.154654

fy	principal	interest	ratio
<dbl>	<chr>	<chr>	<dbl>
2001	154,166,026	0	0.000000
2002	271,518,687	0	0.000000
2003	138,351,231	0	0.000000
2004	21,400,000	997,469,105	46.610706
2005	37,400,000	1,061,205,268	28.374472
2006	1,000,000,000	1,113,124,277	1.113124
2007	6,995,000	1,115,485,186	159.468933

1-10 of 25 rows

Previous **1** 2 3 Next[Hide](#)

```
GObond_debt %>% ggplot() +
  geom_line(aes(x=fy, y=principal, color = "Principal"))+
  geom_line(aes(x=fy, y=interest, color = "Interest"))
```

[Hide](#)

```
# short term borrowing, first observation is in 2004?
short_debt <- exp_temp %>%
  filter(obj_seq_type == 88110108 | obj_seq_type == 88130108) %>%
  group_by(fy, obj_seq_type) %>%
  summarize(sum = sum(expenditure, na.rm=TRUE)) %>%
  pivot_wider(names_from = obj_seq_type, values_from = sum) %>%
  mutate(principal = `88110108`,
         interest = `88130108`,
         ratio = (as.numeric(interest)/as.numeric(principal)))

short_debt %>% select(principal, interest, ratio) %>%
  mutate(across(principal:interest, ~format(., big.mark= ",", scientific = F)))
```

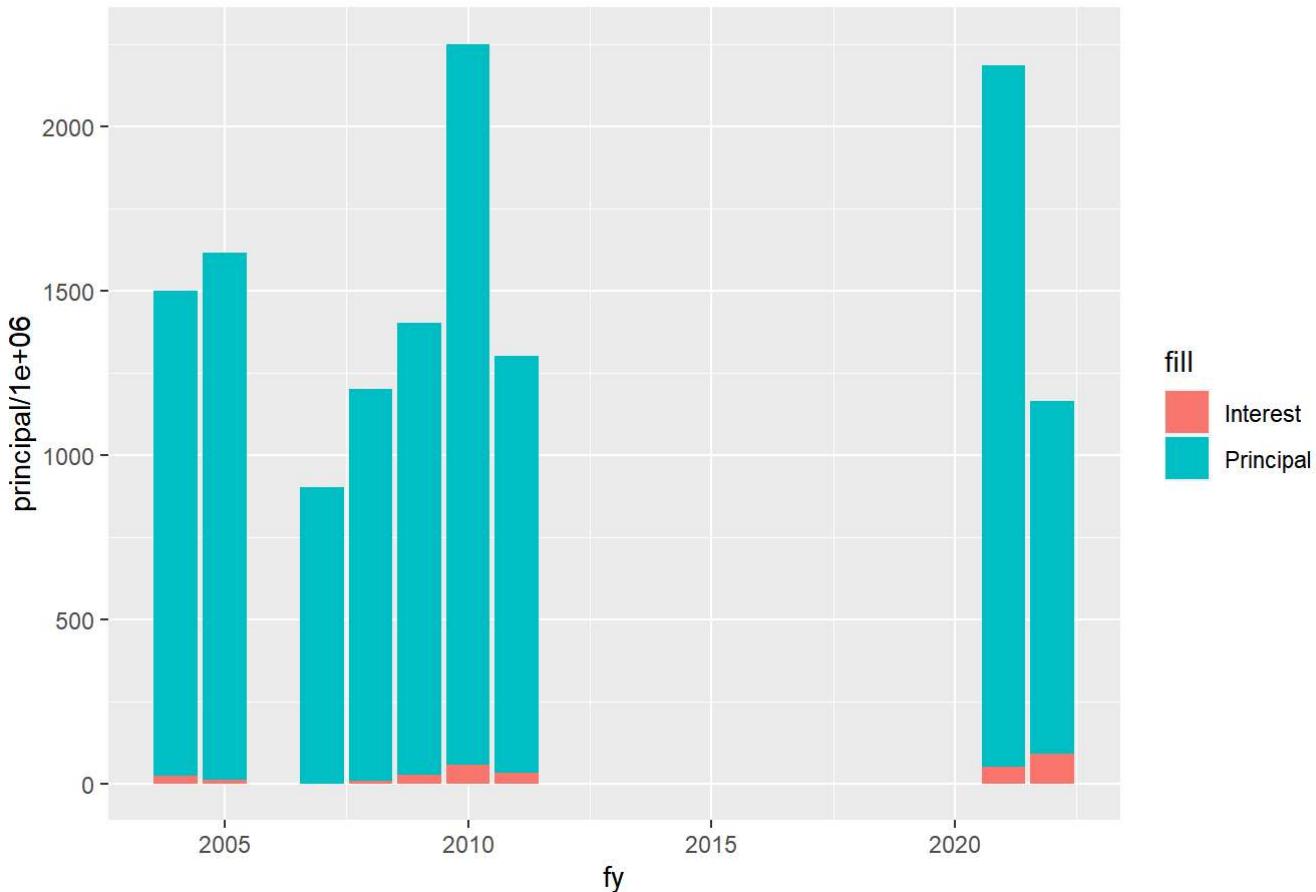
fy	principal	interest	ratio
	<dbl> <chr>	<chr>	<dbl>
2004	1,500,000,000	22,364,583	0.014909722
2005	1,615,000,000	10,672,222	0.006608187
2007	900,000,000	NA	NA
2008	1,200,000,000	6,233,333	0.005194444
2009	1,400,000,000	26,675,000	0.019053571
2010	2,250,000,000	55,277,778	0.024567901
2011	1,300,000,000	30,975,000	0.023826923
2021	2,184,745,000	51,007,557	0.023347144
2022	1,164,255,000	90,437,183	0.077678157

9 rows

Hide

```
short_debt %>% ggplot() +
  geom_col(aes(x=fy, y=principal/1000000, fill = "Principal"))+
  geom_col(aes(x=fy, y=interest/1000000, fill = "Interest")) +
  labs(title = "Short Term Borrowing: Principal and Interest Payments")
```

Short Term Borrowing: Principal and Interest Payments



[Hide](#)

```
capitalprojects <- exp_temp %>%filter(object == "8800")

all_debt <- exp_temp %>%
  filter(fund != "0455" & (object == "8811" | object == "8813" | object == "8800")) %>%
  group_by(fy, object) %>%
  summarize(sum = sum(expenditure, na.rm=TRUE)) %>%
  pivot_wider(names_from = object, values_from = sum) %>%
  mutate(principal = `8811`,
         interest = `8813`,
         CapitalProjects = `8800`,
         ratio = (as.numeric(interest)/as.numeric(principal)))

all_debt %>% select(principal, interest, CapitalProjects, ratio) %>%
  mutate(across(principal:CapitalProjects, ~format(., big.mark= ",", scientific = F)))
```

fy	principal	interest	CapitalProjects	ratio
	<dbl>	<chr>	<chr>	<dbl>
1998	575,371,231	259,385,877	225,147,958	0.4508148
1999	422,975,040	267,956,231	239,571,392	0.6335036
2000	430,464,406	287,154,654	256,685,875	0.6670811
2001	585,553,477	336,582,816	253,461,423	0.5748114

fy	principal	interest	CapitalProjects	ratio
	<dbl>	<chr>	<chr>	<dbl>
2002	740,370,036	382,634,975	257,622,074	0.5168159
2003	1,658,569,732	474,937,865	256,264,319	0.2863539
2004	1,923,668,657	1,019,833,688	268,750,574	0.5301504
2005	2,153,260,524	1,071,877,490	279,939,826	0.4977928
2006	1,565,449,887	1,113,124,277	302,328,995	0.7110571
2007	1,477,592,635	1,115,485,186	301,723,144	0.7549342

1-10 of 25 rows

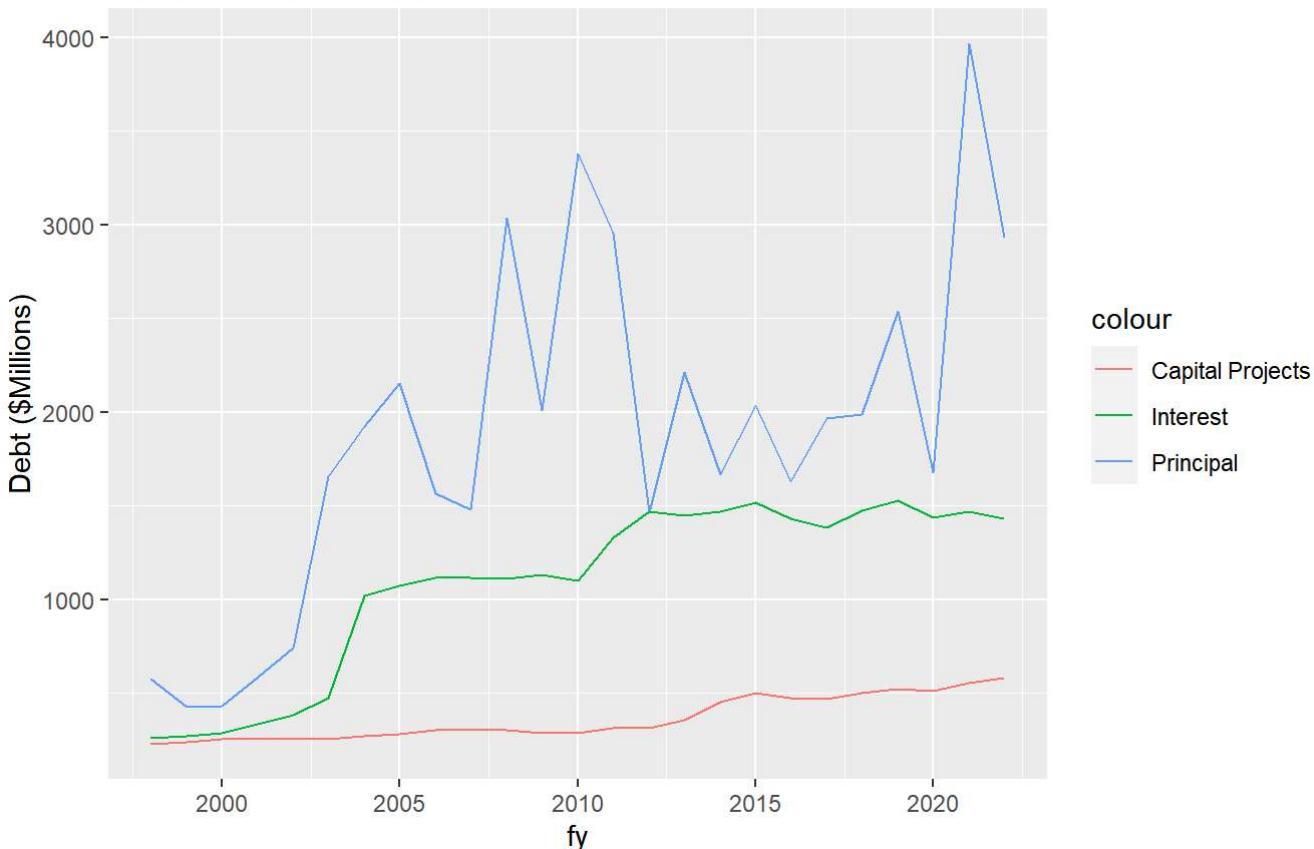
Previous 1 2 3 Next

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```
all_debt %>% ggplot() +
  geom_line(aes(x=fy, y=principal/1000000, color = "Principal"))+
  geom_line(aes(x=fy, y=interest/1000000, color = "Interest"))+
  geom_line(aes(x=fy, y = CapitalProjects / 1000000, color = "Capital Projects"))+
  labs(y = "Debt ($Millions)", title = "Short term borrowing and GO Bonds",
       subtitle = "Principal and Interest payments")
```

Short term borrowing and GO Bonds

Principal and Interest payments



Capital projects include the IL Civic Center and Build Illinois Bonds. Tollway principal and interest has been dropped from Debt Service but is counted in Tollway Expenditure Cost.

[Hide](#)

```

debt_drop <- exp_temp %>%
  filter(object == "8841" | object == "8811")
# escrow OR principle

#debt_drop %>% group_by(fy) %>% summarize(sum = sum(expenditure)) %>% arrange(-fy)

debt_keep <- exp_temp %>%
  filter(fund != "0455" & (object == "8813" | object == "8800" ))
# examine the debt costs we want to include

#debt_keep %>% group_by(fy) %>% summarize(sum = sum(expenditure)) %>% arrange(-fy)

exp_temp <- anti_join(exp_temp, debt_drop)
exp_temp <- anti_join(exp_temp, debt_keep)

debt_keep <- debt_keep %>%
  mutate(
    agency = ifelse(fund != "0455" & (object == "8813" | object == "8800"), "903", as.character(agency)),
    group = ifelse(fund != "0455" & (object == "8813" | object == "8800"), "903", as.character(group)),
    in_ff = ifelse(group == "903", 1, as.character(in_ff)))

debt_keep_yearly <- debt_keep %>% group_by(fy, group) %>% summarize(debt_cost = sum(expenditure,na.rm=TRUE)/1000000) %>% select(-group)

```

Medicaid

Medicaid. That portion of the Healthcare and Family Services (or Public Aid in earlier years, agency code 478) budget for Medical (appr_organization code 65) for awards and grants (object codes 4400 and 4900).

State CURE will remain in the Medicaid expenditure category due to the nature of it being federal funds providing public health services and funding to locations that provide public services.

- Uses same appropriation name of “HEALTHCARE PROVIDER RELIEF” and fund == 0793 and obj_seq_type == 49000000. So can defend the “mistake” of including healthcare provider relief as Medicaid expenditure.

Add Fiscal Future group codes

Hide

```

exp_temp <- exp_temp %>%
  #mutate(agency = as.numeric(agency) ) %>%
  # arrange(agency)%>%
  mutate(
    group = case_when(
      agency>"100"& agency<"200" ~ "910", # Legislative

      agency == "528" | (agency>"200" & agency<"300") ~ "920", # judicial
      pension>0 ~ "901", # pensions
      (agency>"309" & agency<"400") ~ "930",     # elected officers

      agency == "586" ~ "959", # create new K-12 group

      agency=="402" | agency=="418" | agency=="478" | agency=="444" | agency=="482" ~ as.character(ag
      ency), # aging, CFS, HFS, human services, public health
      T ~ as.character(group))
    ) %>%
  )

  mutate(group = case_when(
    agency=="478" & (appr_org=="01" | appr_org == "65" | appr_org=="88") & (object=="4900" | object==
    "4400") ~ "945", # separates CHIP from health and human services and saves it as Medicaid

    agency == "586" & fund == "0355" ~ "945", # 586 (Board of Edu) has special education which is pa
    rt of medicaid

    # OLD CODE: agency == "586" & appr_org == "18" ~ "945", # Spec. Edu Medicaid Matching

    agency=="425" | agency=="466" | agency=="546" | agency=="569" | agency=="578" | agency=="583" | a
    gency=="591" | agency=="592" | agency=="493" | agency=="588" ~ "941", # public safety & Corrections

    agency=="420" | agency=="494" | agency=="406" | agency=="557" ~ as.character(agency), # econ dev
    t & infra, tollway

    agency=="511" | agency=="554" | agency=="574" | agency=="598" ~ "946", # Capital improvement

    agency=="422" | agency=="532" ~ as.character(agency), # environment & nat. resources

    agency=="440" | agency=="446" | agency=="524" | agency=="563" ~ "944", # business regulation

    agency=="492" ~ "492", # revenue

    agency == "416" ~ "416", # central management services
    agency=="448" & fy > 2016 ~ "416", #add DoIT to central management

    T ~ as.character(group))) %>%
  )

  mutate(group = case_when(
    agency=="684" | agency=="691" ~ as.character(agency),
    agency=="692" | agency=="695" | (agency>"599" & agency<"677") ~ "960", # higher education

    agency=="427" ~ as.character(agency), # employment security
  )
)

```

```

agency=="507" | agency=="442" | agency=="445" | agency=="452" | agency=="458" | agency=="497" ~ "9
48", # other departments

# other boards & Commissions
agency=="503" | agency=="509" | agency=="510" | agency=="565" | agency=="517" | agency=="525" | ag
ency=="526" | agency=="529" | agency=="537" | agency=="541" | agency=="542" | agency=="548" | agency
=="555" | agency=="558" | agency=="559" | agency=="562" | agency=="564" | agency=="568" | agency=="57
9" | agency=="580" | agency=="587" | agency=="590" | agency=="527" | agency=="585" | agency=="567" |
agency=="571" | agency=="575" | agency=="540" | agency=="576" | agency=="564" | agency=="534" | agen
cy=="520" | agency=="506" | agency == "533" ~ "949",

# non-pension expenditures of retirement funds moved to "Other Departments"
# should have removed pension expenditures already from exp_temp in Pensions step above
agency=="131" | agency=="275" | agency=="589" | agency=="593" | agency=="594" | agency=="693" ~ "948",
T ~ as.character(group))) %>%
mutate(group_name =
  case_when(
    group == "416" ~ "Central Management",
    group == "478" ~ "Healthcare and Family Services",
    group == "482" ~ "Public Health",
    group == "900" ~ "NOT IN FRAME",
    group == "901" ~ "STATE PENSION CONTRIBUTION",
    group == "903" ~ "DEBT SERVICE",
    group == "910" ~ "LEGISLATIVE" ,
    group == "920" ~ "JUDICIAL" ,
    group == "930" ~ "ELECTED OFFICERS" ,
    group == "940" ~ "OTHER HEALTH-RELATED",
    group == "941" ~ "PUBLIC SAFETY" ,
    group == "942" ~ "ECON DEVT & INFRASTRUCTURE" ,
    group == "943" ~ "CENTRAL SERVICES",
    group == "944" ~ "BUS & PROFESSION REGULATION" ,
    group == "945" ~ "MEDICAID" ,
    group == "946" ~ "CAPITAL IMPROVEMENT" ,
    group == "948" ~ "OTHER DEPARTMENTS" ,
    group == "949" ~ "OTHER BOARDS & COMMISSIONS" ,
    group == "959" ~ "K-12 EDUCATION" ,
    group == "960" ~ "UNIVERSITY EDUCATION" ,
    group == agency ~ as.character(group),
    TRUE ~ "Check name"),
  year = fy)

exp_temp %>% filter(group_name == "Check name")

```

0 rows | 1-9 of 37 columns

[Hide](#)

```
#write_csv(exp_temp, "all_expenditures_recoded.csv")
```

All expenditures recoded but not aggregated: Allows for inspection of individual expenditures within larger categories. This stage of the data is extremely useful for investigating almost all questions we have about the data.

Note that these are the raw figures BEFORE we take the additional steps:

- Subtract employee insurance premiums from State Employee Healthcare expenditures
- Subtract tax refunds from tax revenues by revenue type.
- Subtract employee pension contributions (originally a dropped revenue) from State Pension expenditures
- **NOT DOING ANYMORE:** ~~Add employee health costs and certain pension contributions to All Other Revenues~~

Modify Revenue data

Revenue Categories NOT included in Fiscal Futures:

- 32. Garnishment-Levies. (State is fiduciary, not beneficiary.)
- 45. Student Fees-Universities. (Excluded from state-level budget.)
- 51. Retirement Contributions (of individuals and non-state entities).
- 66. Proceeds, Investment Maturities. (Not sustainable flow.)
- 72. Bond Issue Proceeds. (Not sustainable flow.)
- 75. Inter-Agency Receipts.
- 79. Cook County Intergovernmental Transfers. (State is not beneficiary.)
- 98. Prior Year Refunds.

All Other Sources

Expanded to include the following smaller sources:

- 30. Horse Racing Taxes & Fees.
- 60. Other Grants and Contracts.
- 63. Investment Income.

For aggregating revenue, use the rev_1998_2022 dataframe, join the funds_ab_in_2022 file to it, and then join the ioc_source_type file to the dataset. Remember: You need to update the funds_ab_in and ioc_source_type file every year!

[Hide](#)

```
# fund info to revenue for all years
rev_temp <- inner_join(rev_1998_2022, funds_ab_in_2022, by = "fund") %>% arrange(source)

# need to update the ioc_source_type file every year!
ioc_source_type <- readxl::read_xlsx("C:/Users/aleaw/OneDrive/Documents/PhD Fall 2021 - Spring 2022/Merriman RA/Fiscal Futures FY2022/Replication-Files/ioc_source_updated22_AWM.xlsx")

rev_temp <- left_join(rev_temp, ioc_source_type, by = "source")
# automatically used source, source name does not match for the join to work using source_name
```

Update Agencies: Early agencies replaced by successors

[Hide](#)

```

# recodes old agency numbers to consistent agency number
rev_temp <- rev_temp %>%
  mutate(agency = case_when(
    (agency=="438" | agency=="475" | agency == "505") ~ "440",
    # financial institution & professional regulation &
    # banks and real estate --> coded as financial and professional reg
    agency == "473" ~ "588", # nuclear safety moved into IEMA
    (agency == "531" | agency == "577") ~ "532", # coded as EPA
    (agency == "556" | agency == "538") ~ "406", # coded as agriculture
    agency == "560" ~ "592", # IL finance authority (fire trucks and agriculture stuff)to state fire
    marshal
    agency == "570" & fund == "0011" ~ "494",    # city of Chicago road fund to transportation
    TRUE ~ (as.character(agency))))
```

Federal to State Transfers

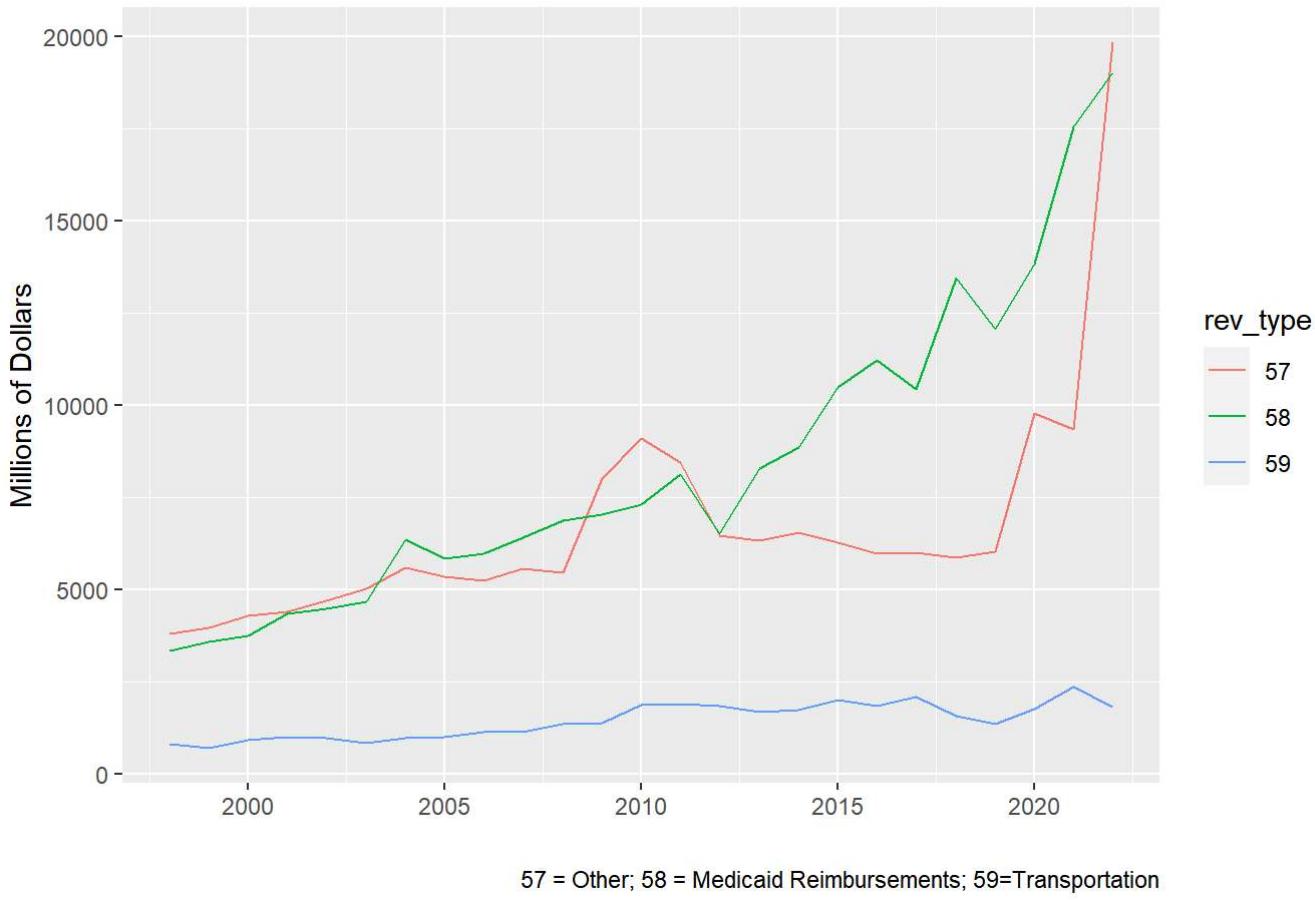
[Hide](#)

```

rev_temp <- rev_temp %>%
  mutate(
    rev_type = ifelse(rev_type=="57" & agency=="478" & (source=="0618" | source=="2364" | source=="0660" |
    source=="1552" | source=="2306" | source=="2076" | source=="0676" | source=="0692"), "58", rev_type),
    rev_type_name = ifelse(rev_type=="58", "FEDERAL TRANSPORTATION", rev_type_name),
    rev_type = ifelse(rev_type=="57" & agency=="494", "59", rev_type),
    rev_type_name = ifelse(rev_type=="59", "FEDERAL TRANSPORTATION", rev_type_name),
    rev_type_name = ifelse(rev_type=="57", "FEDERAL OTHER", rev_type_name),
    rev_type = ifelse(rev_type=="6", "06", rev_type),
    rev_type = ifelse(rev_type=="9", "09", rev_type))

rev_temp %>%
  filter(rev_type == "58" | rev_type == "59" | rev_type == "57") %>%
  group_by(fy, rev_type, rev_type_name) %>%
  summarise(receipts = sum(receipts, na.rm = TRUE)/1000000) %>%
  ggplot() +
  geom_line(aes(x=fy, y=receipts,color=rev_type)) +
  labs(title = "Federal to State Transfers",
       y = "Millions of Dollars", x = "",
            caption = "57 = Other; 58 = Medicaid Reimbursements; 59=Transportation")
```

Federal to State Transfers



57 = Other; 58 = Medicaid Reimbursements; 59=Transportation

Pension Contributions

Employee contributions to pension are a revenue source for the state. In order to get the net cost of pensions for the state, employee contributions should be subtracted in order to calculate net costs.

- current year employee revenue source = 0573
- contributions by employee == 572 (stops at 2011)

[Hide](#)

```
#pension_rev_check <- rev_temp %>% filter(source == "0572" | source == "0573" | source == "0574" | source == "0577" | source == "1982" | source == "2567")  
  
#write_csv(pension_rev_check, "pension_revenue_check.csv")  
  
# current year employee revenue source = 0573, contributions by employee == 572 (stops at 2011)  
pension_rev <- rev_temp %>%  
  filter(rev_type == "51" & source == "0573" | source == "0572")  
  
rev_type <- anti_join(rev_temp, pension_rev)  
  
pension_rev_yearly <- rev_temp %>%  
  filter(rev_type == "51" & source == "0573" | source == "0572") %>%  
  group_by(fy, rev_type) %>%  
  summarise(pension_rev_sum = sum(receipts, na.rm=TRUE)/1000000) %>% select(-rev_type)
```

`pension_rev` should be subtracted from the state pension expenditures. Employee contributions to pensions are a revenue source. We want net pension cost, therefore subtract employee contributions from pension costs.

Health Insurance Premiums from Employees

Employee insurance premiums for healthcare are a revenue source for the state. In order to get the true cost of State Employee Healthcare, total employee insurance premiums should be subtracted from the healthcare expenditure total (`exp_904 - premiums`). Gather all employee premiums into `opt_premiums` and subtract it from the Expenditure table after aggregating and pivoting steps.

0120 = ins prem-option life 0120 = ins prem-optional life/univ

0347 = optional health - HMO 0348 = optional health - dental 0349 = optional health - univ/local SI 0350 = optional health - univ/local 0351 = optional health - retirement 0352 = optional health - retirement SI 0353 = optional health - retire/dental 0354 = optional health - retirement hmo

2199-2209 = various HMOs, dental, health plans from Health Insurance Reserve (fund)

[Hide](#)

```

opt_premiums_CHECK <- rev_temp %>%
  filter((fund=="0907" | fund == "0457") & (source=="0120" | source=="0121" | (source>"0345" & source<"0357") | (source>"2199" & source<"2209"))
)

#collect optional insurance premiums to fund 0907 for use in eehc expenditure
rev_temp <- rev_temp %>%
  mutate(med_option_recent = ifelse(
    fund=="0907" & (source=="0120" | source=="0121" | (source>"0345" & source<"0357") | (source>"2199" & source<"2209")), 1, 0),

  # adds more rev_type codes
  rev_type = case_when(
    fund == "0427" ~ "12", # pub utility tax
    fund == "0742" | fund == "0473" ~ "24", # insurance and fees
    fund == "0976" ~ "36", # receipts from rev producing
    fund == "0392" | fund == "0723" ~ "39", # Licenses and fees
    fund == "0656" ~ "78", #all other rev sources
    TRUE ~ as.character(rev_type)))
# if not mentioned, then rev_type as it was

# optional insurance premiums = employee insurance premiums
med_option_recent <- rev_temp %>%
  group_by(fy, med_option_recent) %>%
  summarize(med_option_amt_recent = sum(receipts)/1000000) %>%
  filter(med_option_recent == 1) %>%
  rename(year = fy) %>%
  select(-med_option_recent)

med_option_long <- rev_temp %>% filter(med_option_recent == 1)
# 361 observations have med_option_recent == 1

rev_temp <- rev_temp %>% filter(med_option_recent != 1)
# could also do an anti_join with rev_temp and med_option dataframes

```

You must then subtract the employee premiums from the state healthcare expenditures totals. Employee premiums on the revenue side should have receipts coded as \$0 or be dropped using anti_join().

Transfers in and Out:

I don't have much faith in the transfers in and out steps- AWM

I am currently choosing to exclude the totals from this step. Overall, this decreases the total revenues in "All Other Revenues" by a few million dollars.

- in_from_out <- c("0847", "0867", "1175", "1176", "1177", "1178", "1181", "1182", "1582", "1592", "1745", "1982", "2174", "2264")
- See the methodology document for the list of what these sources/funds are.

[Hide](#)

```

rev_temp <- rev_temp %>%
  filter(in_ff == 1) %>%
  mutate(local = ifelse(is.na(local), 0, local)) %>% # drops all revenue observations that were coded
as "Local == 1"
  filter(local != 1)

# 1175 doesn't exist?
in_from_out <- c("0847", "0867", "1175", "1176", "1177", "1178", "1181", "1182", "1582", "1592", "174
5", "1982", "2174", "2264")

# what does this actually include:
# all are items with rev_type = 75 originally.
in_out_df <- rev_type %>%
  mutate(infromout = ifelse(source %in% in_from_out, 1, 0)) %>%
  filter(infromout == 1)

rev_temp <- rev_temp %>%
  mutate(rev_type_new = ifelse(source %in% in_from_out, "76", rev_type))
# if source contains any of the codes in in_from_out, code them as 76 (all other rev).

```

Hide

```
# revenue types to drop
drop_type <- c("32", "45", "51",
              "66", "72", "75", "79", "98")

# drops Blank, Student Fees, Retirement contributions, proceeds/investments,
# bond issue proceeds, interagency receipts, cook IGT, Prior year refunds.
```

```
rev_temp <- rev_temp %>% filter(!rev_type_new %in% drop_type)
# keep observations that do not have a revenue type mentioned in drop_type

table(rev_temp$rev_type_new)
```

```

##          02      03      06      09      12      15      18      21      24      27      30      31      33
##    161     124     828     127     575     258      45    1420     450      76     659     124    130
##    35      36      39      42      48      54      57      58      59      60      63      76      78
##   660    5152    9044    2755      31    1239    6451     620     226     103    5081     154  10880
##        99
##        964

```

Hide

```
rev_temp %>%
  group_by(fy, rev_type_new) %>%
  summarize(total_receipts = sum(receipts)/1000000) %>%
  pivot_wider(names_from = rev_type_new, values_from = total_receipts, names_prefix = "rev_")
```

fy **rev_02** **rev_03** **rev_06** **rev_09** **rev_12** **rev_15** **rev_18** **rev_21** ▶

fy	rev_02	rev_03	rev_06	rev_09	rev_12	rev_15	rev_18	rev_21
<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>
1998	6846.827	1860.322	7198.401	1300.658	1193.328	464.2421	57.03395	250.4342
1999	7225.764	1854.888	7646.728	1328.799	1423.402	499.0560	57.23468	346.9777
2000	7685.811	2067.907	8218.148	1356.283	1524.369	467.3495	127.86824	348.0088
2001	7995.794	1789.672	8175.164	1366.563	1605.878	472.6152	124.31482	361.0388
2002	7471.385	1383.822	8279.112	1373.522	1568.098	468.7761	122.00049	329.1675
2003	7340.982	1293.187	8227.828	1388.316	1439.252	699.7512	122.76700	236.9498
2004	7272.488	1596.453	8636.675	1423.884	1536.122	760.2273	126.77083	221.7226
2005	7978.780	1971.814	8980.959	1434.595	1501.032	656.4727	147.23758	310.4202
2006	8635.104	2400.269	9638.334	1446.067	1549.563	640.3341	152.29981	271.8636
2007	9408.437	2936.358	9785.236	1453.707	1604.179	638.7959	155.68041	264.3954

1-10 of 25 rows | 1-9 of 29 columns

Previous **1** 2 3 Next

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```
# combines smallest 4 categories to to "Other"
# they were the 4 smallest in past years, are they still the 4 smallest?

rev_temp <- rev_temp %>%
  mutate(rev_type_new = ifelse(rev_type=="30" | rev_type=="60" | rev_type=="63" | rev_type=="76", "78", rev_type_new))



```

Pivoting and Merging

- State employee contributions (eehc from eehc2_amt) should be subtracted from state employee healthcare expenditures. State employer contributions should be dropped to avoid double counting costs.
- State employee health insurance premiums should be subtracted from state healthcare costs for the net healthcare cost.
- Subtract employee insurance premiums from State Employee Healthcare Expenditures (group == 904) - Employee Premiums = Actual state healthcare costs.
 - $ff_exp\$exp904 - med_option\$med_option_amt_recent = statehealthcarecosts$
- Employee contributions should be subtracted from state pension costs. - $ff_exp\$exp901 - rev_51 = statepensioncosts$ even though rev_type == 51 (retirement contributions) is dropped based on past code.

- Stata code, no longer doing: State pension contributions funded by bonds (*pension_amt* from *pension2_fy22*) should be added to Other revenues
- Local Government Transfers (*exp_970*) should be on the expenditure side

Revenues

I chose to drop *rev_76* for Transfers in and Out because I do not understand why that step occurs in the previously used Stata code. If I keep *rev_76* in and include it in *rev_78* for All Other Revenues, then the difference between R and Stata code should be resolved.

- after Stata code is edited to drop employee insurance premium revenue from all other revenues. Currently it keeps it in AND subtracts it from state healthcare expenditures.

[Hide](#)

```
ff_rev <- rev_temp %>%
  group_by(rev_type_new, fy) %>%
  summarize(sum_receipts = sum(receipts, na.rm=TRUE)/1000000 ) %>%
  pivot_wider(names_from = "rev_type_new", values_from = "sum_receipts", names_prefix = "rev_")

ff_rev<- left_join(ff_rev, tax_refund)

#ff_rev <- left_join(ff_rev, pension2_fy22, by=c("fy" = "year"))

#ff_rev <- left_join(ff_rev, eehc2_amt)
ff_rev <- mutate_all(ff_rev, ~replace_na(.,0))

ff_rev <- ff_rev %>%
  mutate(rev_02 = rev_02 - ref_02,
        rev_03 = rev_03 - ref_03,
        rev_06 = rev_06 - ref_06,
        rev_09 = rev_09 - ref_09,
        rev_21 = rev_21 - ref_21,
        rev_24 = rev_24 - ref_24,
        rev_35 = rev_35 - ref_35

      #  rev_78new = rev_78 #+ pension_amt #+ eehc
      ) %>%
  select(-c(ref_02:ref_35, rev_99, rev_NA, rev_76#, pension_amt , rev_76,
           # , eehc
           )))

ff_rev
```

fy	rev_02	rev_03	rev_06	rev_09	rev_12	rev_15	rev_18	rev_21	
<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>
1998	6333.821	1631.2235	7198.401	1290.732	1193.328	464.2421	57.03395	246.0342	
1999	6608.855	1577.3846	7646.728	1316.469	1423.402	499.0560	57.23468	342.8019	
2000	6910.388	1697.6258	8218.148	1339.873	1524.369	467.3495	127.86824	340.9423	
2001	7155.534	1550.2850	8175.164	1353.935	1605.878	472.6152	124.31482	353.5388	

fy	rev_02	rev_03	rev_06	rev_09	rev_12	rev_15	rev_18	rev_21	▶
<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>
2002	6638.629	1172.3407	8279.112	1357.865	1568.098	468.7761	122.00049	322.1221	
2003	6095.883	936.2045	8227.828	1373.788	1439.252	699.7512	122.76700	230.3980	
2004	6170.381	987.3950	8636.675	1405.895	1536.122	760.2273	126.77083	214.7349	
2005	6935.970	1604.3463	8980.959	1419.873	1501.032	656.4727	147.23758	301.4213	
2006	7537.443	2061.1801	9638.334	1430.052	1549.563	640.3341	152.29981	263.1216	
2007	8270.778	2644.6063	9785.236	1439.744	1604.179	638.7959	155.68041	255.3954	

1-10 of 25 rows | 1-9 of 23 columns

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Since I already pivot_wider()ed the table in the previous code chunk, I now change each column's name by using rename() to set new variable names. Ideally the final dataframe would have both the variable name and the variable label but I have not done that yet.

Hide

```

aggregate_rev_labels <- ff_rev %>%
  rename("INDIVIDUAL INCOME TAXES, gross of local, net of refunds" = rev_02,
         "CORPORATE INCOME TAXES, gross of PPRT, net of refunds" = rev_03,
         "SALES TAXES, gross of local share" = rev_06 ,
         "MOTOR FUEL TAX, gross of local share, net of refunds" = rev_09 ,
         "PUBLIC UTILITY TAXES, gross of PPRT" = rev_12,
         "CIGARETTE TAXES" = rev_15 ,
         "LIQUOR GALLONAGE TAXES" = rev_18,
         "INHERITANCE TAX" = rev_21,
         "INSURANCE TAXES&FEES&LICENSES, net of refunds" = rev_24 ,
         "CORP FRANCHISE TAXES & FEES" = rev_27,
#       "HORSE RACING TAXES & FEES" = rev_30, # in Other
         "MEDICAL PROVIDER ASSESSMENTS" = rev_31 ,
#       "GARNISHMENT-LEVIES " = rev_32 , # dropped
         "LOTTERY RECEIPTS" = rev_33 ,
         "OTHER TAXES" = rev_35,
         "RECEIPTS FROM REVENUE PRODUCNG" = rev_36,
         "LICENSES, FEES & REGISTRATIONS" = rev_39 ,
         "MOTOR VEHICLE AND OPERATORS" = rev_42 ,
#       "STUDENT FEES-UNIVERSITIES" = rev_45, # dropped
         "RIVERBOAT WAGERING TAXES" = rev_48 ,
#       "RETIREMENT CONTRIBUTIONS " = rev_51, # dropped
         "GIFTS AND BEQUESTS" = rev_54,
         "FEDERAL OTHER" = rev_57 ,
         "FEDERAL MEDICAID" = rev_58,
         "FEDERAL TRANSPORTATION" = rev_59 ,
#       "OTHER GRANTS AND CONTRACTS" = rev_60, #other
#       "INVESTMENT INCOME" = rev_63, # other
#       "PROCEEDS,INVESTMENT MATURITIES" = rev_66 , #dropped
#       "BOND ISSUE PROCEEDS" = rev_72, #dropped
#       "INTER-AGENCY RECEIPTS" = rev_75, #dropped
#       "TRANSFER IN FROM OUT FUNDS" = rev_76, #other
         "ALL OTHER SOURCES" = rev_78,
#       "COOK COUNTY IGT" = rev_79, #dropped
#       "PRIOR YEAR REFUNDS" = rev_98 #dropped
      )

```

aggregate_rev_labels

fy <dbl>	INDIVIDUAL INCOME TAXES, gross of local, net of refunds <dbl>
1998	6333.821
1999	6608.855
2000	6910.388
2001	7155.534
2002	6638.629
2003	6095.883
2004	6170.381

fy <dbl>	INDIVIDUAL INCOME TAXES, gross of local, net of refunds <dbl>
2005	6935.970
2006	7537.443
2007	8270.778

Still contains columns that should be dropped for the clean final aggregate table. Drop the variables I don't want in the output table in the "graphs" section.

Expenditures

Create state employee healthcare costs that reflects the health costs minus the optional insurance premiums that came in ($904_{new} = 904 - med_option_amt_recent$).

Create exp 970 for all local government transfers (exp 971 + exp 972 + exp 975 + exp 976).

Hide

```

ff_exp <- exp_temp %>%
  group_by(fy, group) %>%
  summarize(sum_expenditures = sum(expenditure, na.rm=TRUE)/1000000 ) %>%
  pivot_wider(names_from = "group", values_from = "sum_expenditures", names_prefix = "exp_")%>%

  left_join(debt_keep_yearly) %>%
  mutate(exp_903 = debt_cost) %>%

  left_join(healthcare_costs_yearly) %>%

# join state employee healthcare and subtract employee premiums
  left_join(med_option_recent, by = c("fy" = "year")) %>%
  mutate(exp_904_new = (`healthcare_cost` - `med_option_amt_recent`)) %>% # state employee healthcare
  premiums

  left_join(pension_rev_yearly) %>%
  mutate(exp_901_new = exp_901 - pension_rev_sum) %>% #employee pension contributions

# join Local transfers and create exp_970
  left_join(transfers) %>%
  mutate(exp_970 = exp_971 + exp_972 + exp_975 + exp_976)

ff_exp<- ff_exp %>% select(-c(exp_901, med_option_amt_recent, debt_cost, healthcare_cost, pension_rev
_sum, exp_971:exp_976)) # drop unwanted columns
ff_exp

```

fy **exp_402** **exp_406** **exp_416** **exp_418** **exp_420** **exp_422** **exp_426** **exp_427** ▶

fy	exp_402	exp_406	exp_416	exp_418	exp_420	exp_422	exp_426	exp_427	▶
<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>
1998	214.6376	73.17255	354.3675	1289.563	462.7255	191.8757	957.626	166.4870	
1999	235.7606	87.70511	395.8145	1329.345	522.9768	228.0308	1044.705	166.2004	
2000	260.4630	102.49971	405.9484	1341.543	703.3941	267.7414	1125.874	169.7855	
2001	283.6808	113.95363	404.8524	1357.084	762.4495	307.9027	1200.026	268.9663	
2002	297.1434	114.70770	393.5432	1344.742	810.1440	347.3659	1256.164	324.2663	
2003	303.7034	89.70322	395.0134	1281.919	828.4200	311.5892	1171.980	361.7048	
2004	313.5735	81.37537	474.5009	1251.765	924.2960	270.5926	1193.815	191.0520	
2005	401.9192	70.30822	579.3160	1209.531	420.1164	232.7743	1170.705	169.5050	
2006	420.0285	81.00146	671.2958	1227.482	592.3198	233.4088	1185.022	178.8246	
2007	487.7905	81.85481	691.1958	1242.997	597.0507	253.6090	1122.664	168.8351	

1-10 of 25 rows | 1-9 of 33 columns

Previous **1** 2 3 Next

Clean Table Outputs

Create total revenues and total expenditures only:

- after aggregating expenditures and revenues, pivoting wider, and left_joining the additional mini dataframes (med_option_recent, pension2_fy22, eehc2_amt), then I want to drop the columns that I no longer want and then pivot_longer(). After pivot_longer() and creating rev_long and exp_long , expenditures and revenues are in the same format and can be combined together for the totals and gap each year.

Hide

```

rev_long <- pivot_longer(ff_rev, rev_02:rev_78, names_to = c("type", "Category"), values_to = "Dollar
s", names_sep = "_") %>%
  rename(Year = fy) %>%
  mutate(Category_name = case_when(
    Category == "02" ~ "INDIVIDUAL INCOME TAXES, gross of local, net of refunds" ,
    Category == "03" ~ "CORPORATE INCOME TAXES, gross of PPRT, net of refunds" ,
    Category == "06" ~ "SALES TAXES, gross of local share" ,
    Category == "09" ~ "MOTOR FUEL TAX, gross of local share, net of refunds" ,
    Category == "12" ~ "PUBLIC UTILITY TAXES, gross of PPRT" ,
    Category == "15" ~ "CIGARETTE TAXES" ,
    Category == "18" ~ "LIQUOR GALLONAGE TAXES" ,
    Category == "21" ~ "INHERITANCE TAX" ,
    Category == "24" ~ "INSURANCE TAXES&FEES&LICENSES, net of refunds " ,
    Category == "27" ~ "CORP FRANCHISE TAXES & FEES" ,
    Category == "30" ~ "HORSE RACING TAXES & FEES", # in Other
    Category == "31" ~ "MEDICAL PROVIDER ASSESSMENTS" ,
    Category == "32" ~ "GARNISHMENT-LEVIES" , # dropped
    Category == "33" ~ "LOTTERY RECEIPTS" ,
    Category == "35" ~ "OTHER TAXES" ,
    Category == "36" ~ "RECEIPTS FROM REVENUE PRODUCNG",
    Category == "39" ~ "LICENSES, FEES & REGISTRATIONS" ,
    Category == "42" ~ "MOTOR VEHICLE AND OPERATORS" ,
    Category == "45" ~ "STUDENT FEES-UNIVERSITIES", # dropped
    Category == "48" ~ "RIVERBOAT WAGERING TAXES" ,
    Category == "51" ~ "RETIREMENT CONTRIBUTIONS" , # dropped
    Category == "54" ~ "GIFTS AND BEQUESTS",
    Category == "57" ~ "FEDERAL OTHER" ,
    Category == "58" ~ "FEDERAL MEDICAID",
    Category == "59" ~ "FEDERAL TRANSPORTATION" ,
    Category == "60" ~ "OTHER GRANTS AND CONTRACTS", #other
    Category == "63" ~ "INVESTMENT INCOME", # other
    Category == "66" ~ "PROCEEDS,INVESTMENT MATURITIES" , #dropped
    Category == "72" ~ "BOND ISSUE PROCEEDS", #dropped
    Category == "75" ~ "INTER-AGENCY RECEIPTS ", #dropped
    Category == "76" ~ "TRANSFER IN FROM OUT FUNDS", #other
    Category == "78" ~ "ALL OTHER SOURCES" ,
    Category == "79" ~ "COOK COUNTY IGT", #dropped
    Category == "98" ~ "PRIOR YEAR REFUNDS", #dropped
    T ~ "Check Me!"
```

))

```

exp_long <- pivot_longer(ff_exp, exp_402:exp_970 , names_to = c("type", "Category"), values_to = "Dol
lars", names_sep = "_") %>%
  rename(Year = fy ) %>%
  mutate(Category_name =
    case_when(
      Category == "402" ~ "AGING" ,
      Category == "406" ~ "AGRICULTURE",
      Category == "416" ~ "CENTRAL MANAGEMENT",
      Category == "418" ~ "CHILDREN AND FAMILY SERVICES",
      Category == "420" ~ "COMMERCE AND ECONOMIC OPPORTUNITY",
      Category == "422" ~ "NATURAL RESOURCES" ,
```

```

Category == "426" ~ "CORRECTIONS",
Category == "427" ~ "EMPLOYMENT SECURITY" ,
Category == "444" ~ "HUMAN SERVICES" ,
Category == "448" ~ "Innovation and Technology", # AWM added fy2022
Category == "478" ~ "HEALTHCARE & FAM SER NET OF MEDICAID",
Category == "482" ~ "PUBLIC HEALTH",
Category == "492" ~ "REVENUE",
Category == "494" ~ "TRANSPORTATION" ,
Category == "532" ~ "ENVIRONMENTAL PROTECT AGENCY" ,
Category == "557" ~ "IL STATE TOLL HIGHWAY AUTH" ,
Category == "684" ~ "IL COMMUNITY COLLEGE BOARD",
Category == "691" ~ "IL STUDENT ASSISTANCE COMM" ,
Category == "900" ~ "NOT IN FRAME",
Category == "901" ~ "STATE PENSION CONTRIBUTION",
Category == "903" ~ "DEBT SERVICE",
Category == "904" ~ "State Employee Healthcare",
Category == "910" ~ "LEGISLATIVE" ,
Category == "920" ~ "JUDICIAL" ,
Category == "930" ~ "ELECTED OFFICERS" ,
Category == "940" ~ "OTHER HEALTH-RELATED",
Category == "941" ~ "PUBLIC SAFETY" ,
Category == "942" ~ "ECON DEVT & INFRASTRUCTURE" ,
Category == "943" ~ "CENTRAL SERVICES",
Category == "944" ~ "BUS & PROFESSION REGULATION" ,
Category == "945" ~ "MEDICAID" ,
Category == "946" ~ "CAPITAL IMPROVEMENT" ,
Category == "948" ~ "OTHER DEPARTMENTS" ,
Category == "949" ~ "OTHER BOARDS & COMMISSIONS" ,
Category == "959" ~ "K-12 EDUCATION" ,
Category == "960" ~ "UNIVERSITY EDUCATION",
Category == "970" ~ "Local Govt Transfers",
T ~ "CHECK ME!")
)

```

```

#write_csv(exp_Long, "expenditures_recoded_Long_FY22.csv")
#write_csv(rev_Long, "revenue_recoded_Long_FY22.csv")

```

```

aggregated_totals_long <- rbind(rev_long, exp_long)
aggregated_totals_long

```

Y...	t...	Category	Dollars	Category_name
<dbl>	<chr>	<chr>	<dbl>	<chr>
1998	rev 02	6333.82101		INDIVIDUAL INCOME TAXES, gross of local, net of refunds
1998	rev 03	1631.22352		CORPORATE INCOME TAXES, gross of PPRT, net of refunds
1998	rev 06	7198.40085		SALES TAXES, gross of local share
1998	rev 09	1290.73207		MOTOR FUEL TAX, gross of local share, net of refunds
1998	rev 12	1193.32777		PUBLIC UTILITY TAXES, gross of PPRT
1998	rev 15	464.24209		CIGARETTE TAXES
1998	rev 18	57.03395		LIQUOR GALLONAGE TAXES

Y...	t...	Category	Dollars	Category_name
<dbl>	<chr>	<chr>	<dbl>	<chr>
1998	rev	21	246.03420	INHERITANCE TAX
1998	rev	24	132.33734	INSURANCE TAXES&FEES&LICENSES, net of refunds
1998	rev	27	122.77171	CORP FRANCHISE TAXES & FEES
1-10 of 1,350 rows			Previous	1 2 3 4 5 6 ... 135 Next

[Hide](#)

```
year_totals <- aggregated_totals_long %>%
  group_by(type, Year) %>%
  summarize(Dollars = sum(Dollars, na.rm = TRUE)) %>%
  pivot_wider(names_from = "type", values_from = Dollars) %>%
  rename(
    Expenditures = exp,
    Revenue = rev) %>%
  mutate(Gap = Revenue - Expenditures) %>%
  arrange(desc(Year))
# creates variable for the Gap each year

year_totals
```

Year <dbl>	Expenditures <dbl>	Revenue <dbl>	Gap <dbl>
2022	99358.77	112958.26	13599.4913
2021	92232.33	91391.90	-840.4275
2020	80692.07	77792.44	-2899.6275
2019	73556.97	71807.44	-1749.5352
2018	74102.95	70127.30	-3975.6495
2017	70869.59	61002.40	-9867.1832
2016	63036.79	61625.12	-1411.6683
2015	68983.29	63729.29	-5253.9966
2014	65967.98	62360.29	-3607.6961
2013	62385.23	60527.32	-1857.9129

1-10 of 25 rows Previous 1 2 3 Next

[Hide](#)

```
#write_csv(aggregated_totals_long, "aggregated_totals.csv")
```

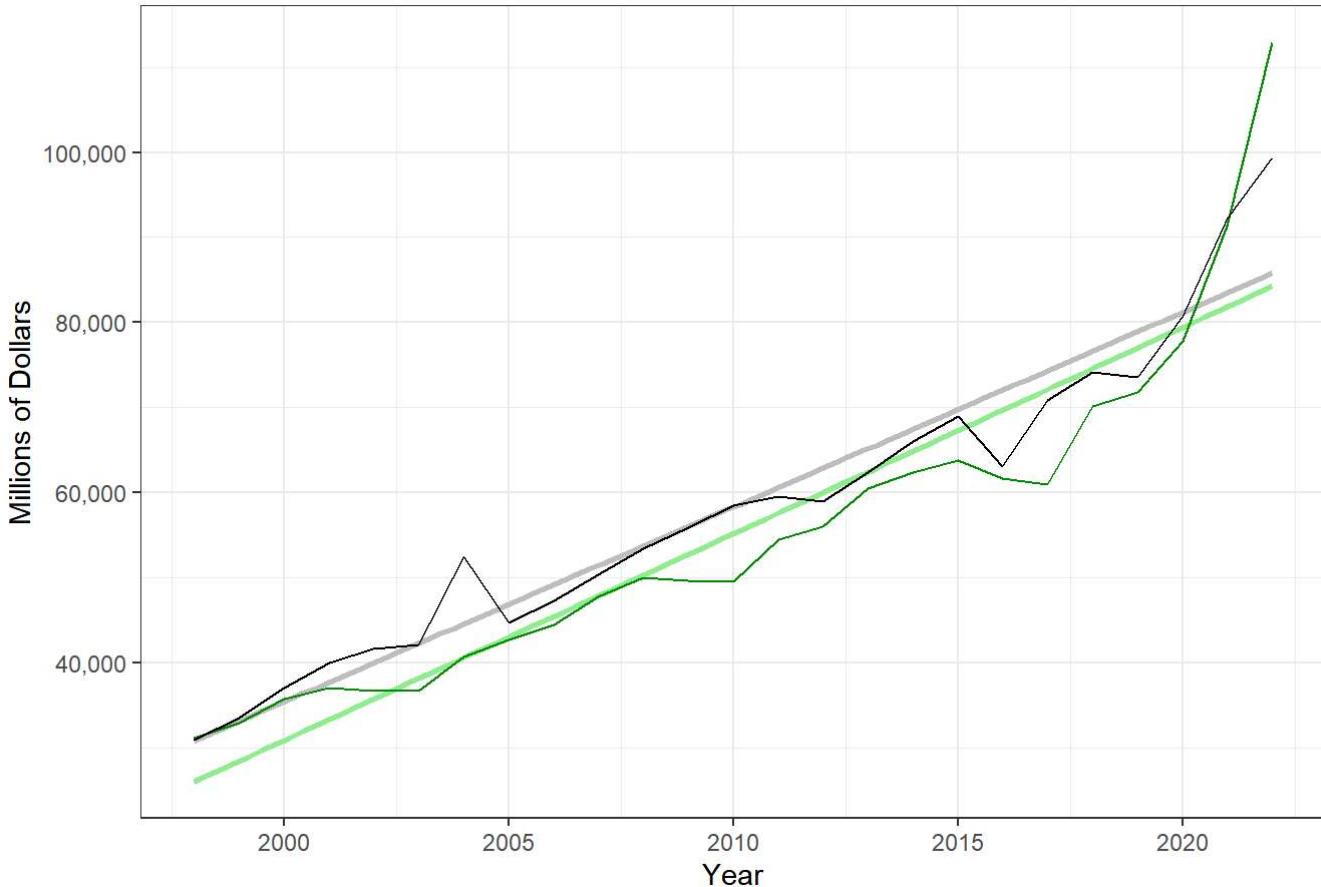
Graphs

Graphs made from aggregated_totals_long dataframe.

[Hide](#)

```
year_totals %>%
  ggplot() +
  # geom_smooth adds regression line, graphed first so it appears behind line graph
  geom_smooth(aes(x = Year, y = Revenue), color = "light green", method = "lm", se = FALSE) +
  geom_smooth(aes(x = Year, y = Expenditures), color = "gray", method = "lm", se = FALSE) +
  # Line graph of revenue and expenditures
  geom_line(aes(x = Year, y = Revenue), color = "green4") +
  geom_line(aes(x = Year, y = Expenditures), color = "black") +
  # labels
  theme_bw() +
  scale_y_continuous(labels = comma) +
  xlab("Year") +
  ylab("Millions of Dollars") +
  ggtitle("Illinois Expenditures and Revenue Totals, 1998-2022")
```

Illinois Expenditures and Revenue Totals, 1998-2022



Expenditure and revenue amounts in millions of dollars:

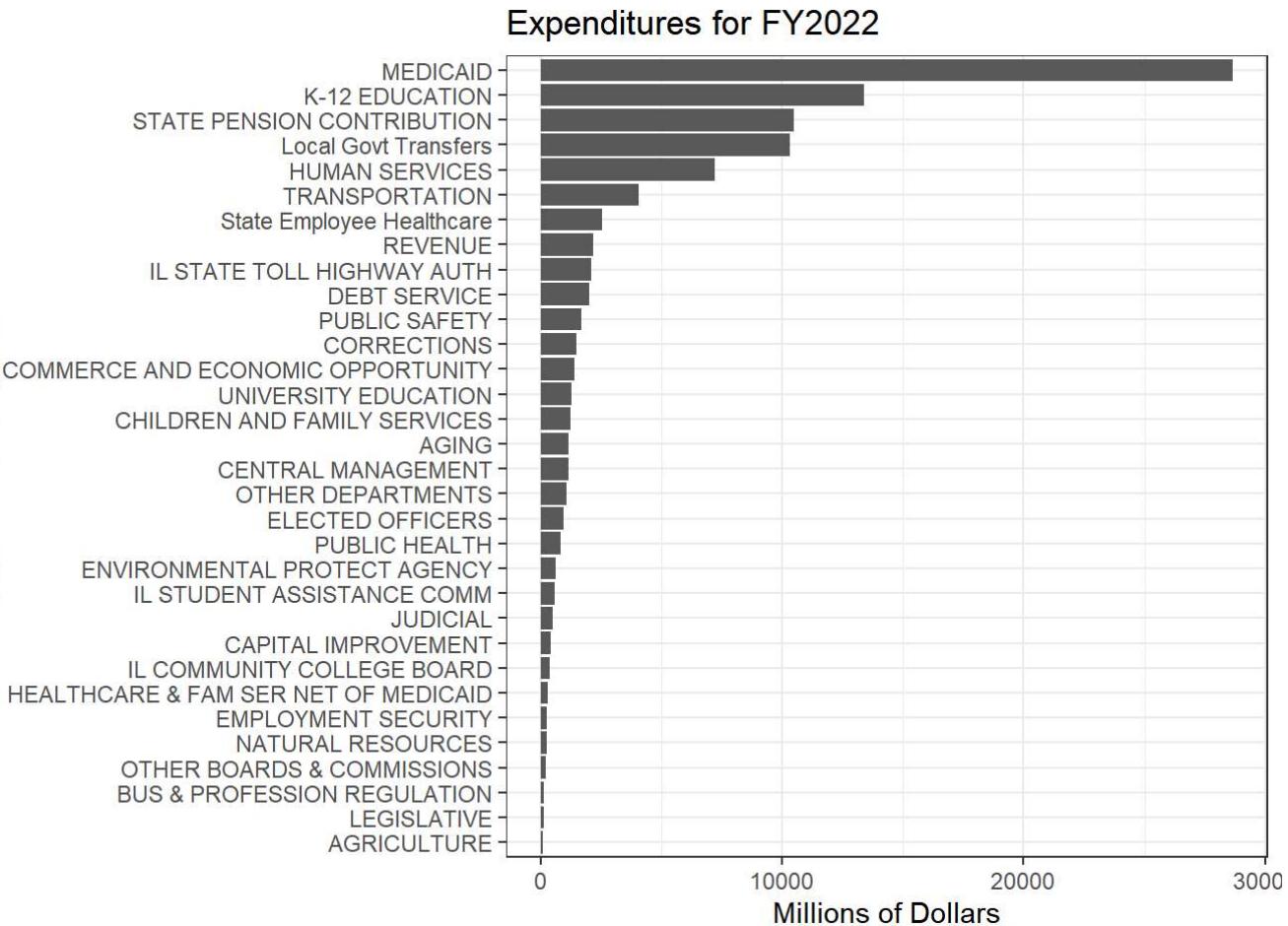
[Hide](#)

```

exp_long %>%
  filter(Year == 2022) %>%
  #mutate(`Total Expenditures` = sum(Dollars, na.rm = TRUE)) %>%
  # select(-c(Year, `Total Expenditures`)) %>%
  arrange(desc(`Dollars`)) %>%
  ggplot() +
  geom_col(aes(x = fct_reorder(Category_name, `Dollars`), y = `Dollars`))+ 
  coord_flip() +
  theme_bw() +
  labs(title = "Expenditures for FY2022") +
  xlab("Expenditure Categories") +
  ylab("Millions of Dollars")

```

Expenditure Categories



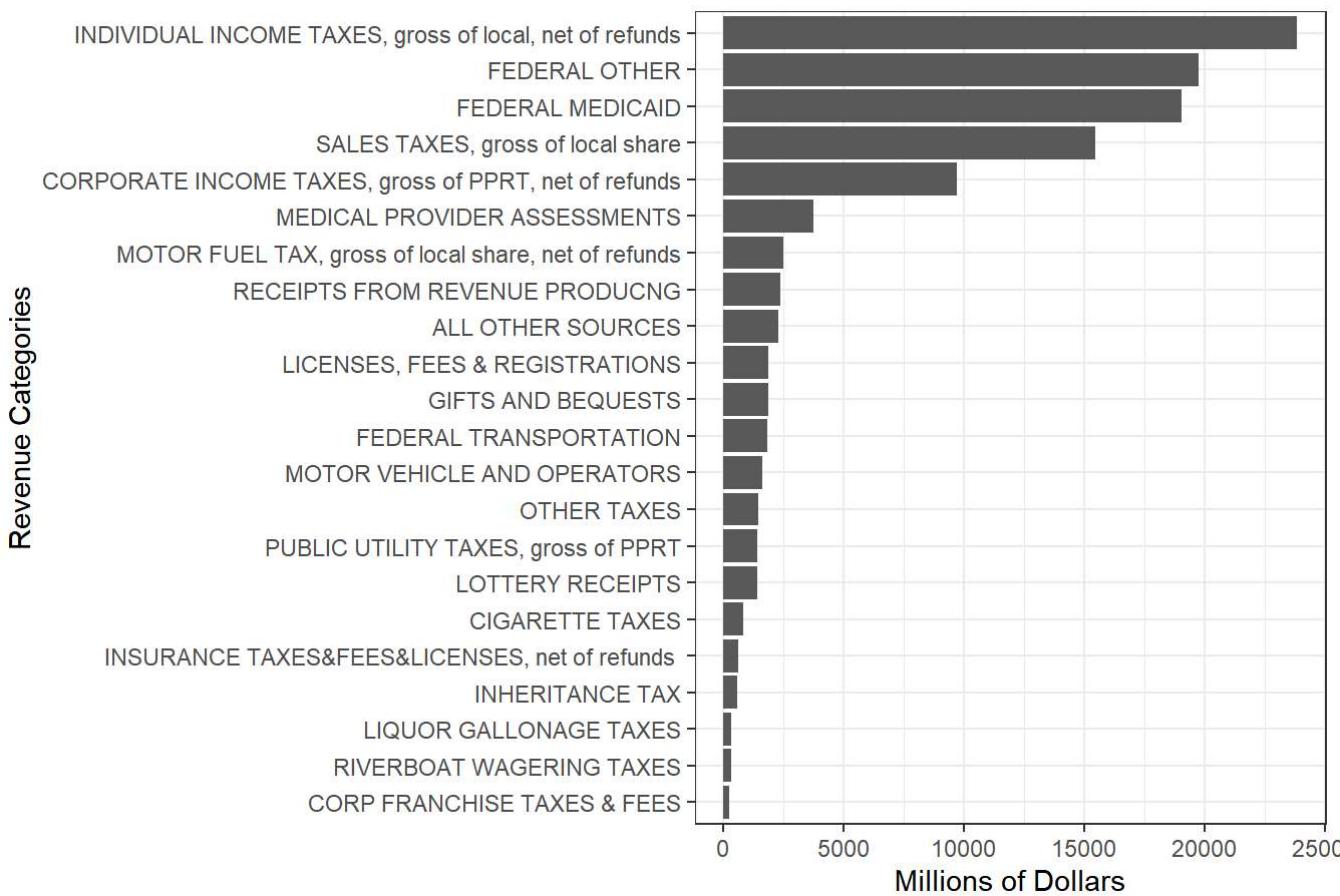
Hide

```

rev_long %>%
  filter(Year == 2022) %>%
  #mutate(`Total Expenditures` = sum(Dollars, na.rm = TRUE)) %>%
  # select(-c(Year, `Total Expenditures`)) %>%
  arrange(desc(`Dollars`)) %>%
  ggplot() +
  geom_col(aes(x = fct_reorder(Category_name, `Dollars`), y = `Dollars`))+ 
  coord_flip() +
  theme_bw() +
  labs(title = "Revenues for FY2022")+
  xlab("Revenue Categories") +
  ylab("Millions of Dollars")

```

Revenues for FY2022

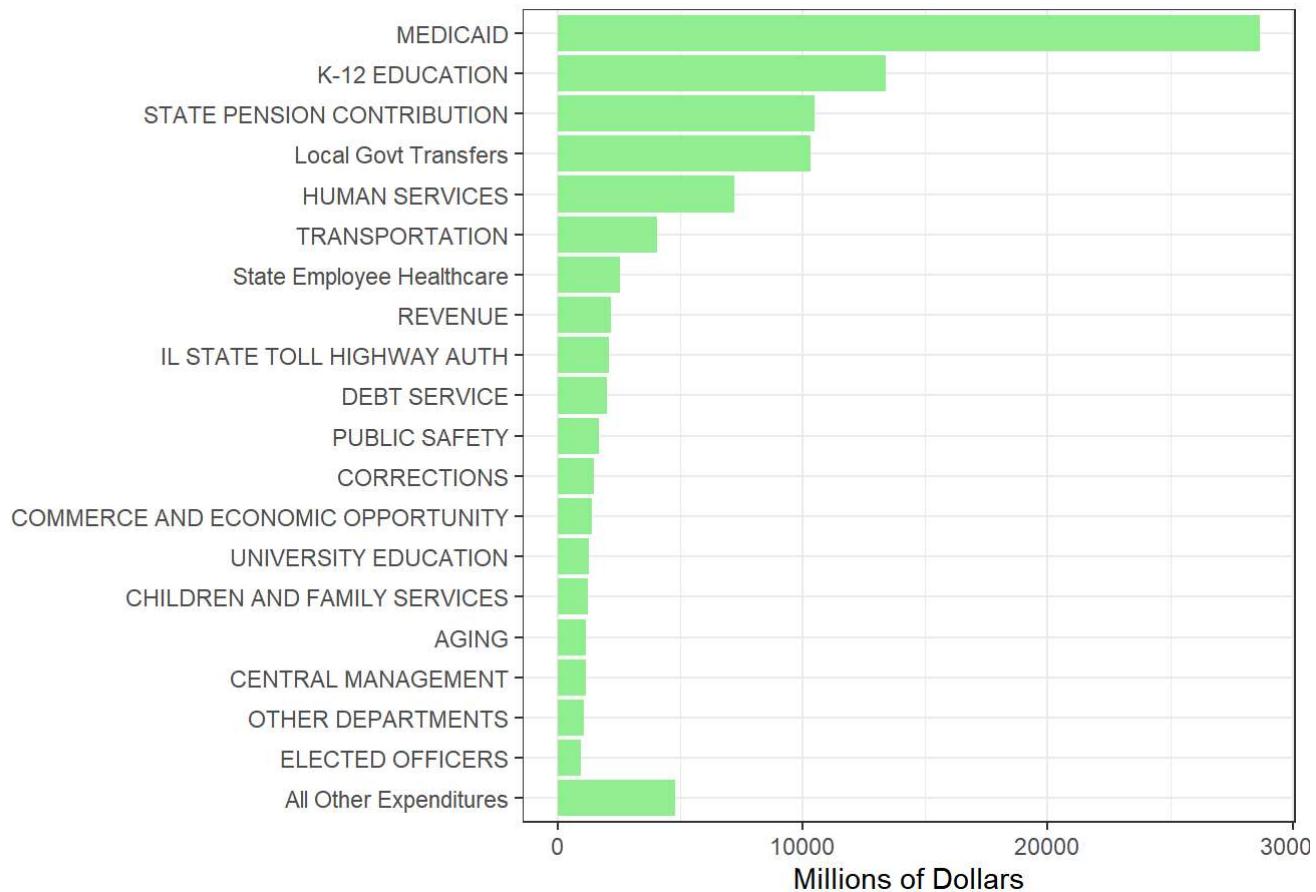


Expenditure and revenues when focusing on largest categories and combining others into “All Other Expenditures(Revenues)”:

Hide

```
exp_long %>%
  filter( Year == 2022) %>%
  mutate(rank = rank(Dollars),
        Category_name = ifelse(rank > 13, Category_name, 'All Other Expenditures')) %>%
# select(-c(Year, Dollars, rank)) %>%
  arrange(desc(Dollars)) %>%
  ggplot() +
  geom_col(aes(x = fct_reorder(Category_name, `Dollars`), y = `Dollars`), fill = "light green")+
  coord_flip() +
  theme_bw() +
  labs(title = "Expenditures for FY2022") +
  xlab("") +
  ylab("Millions of Dollars")
```

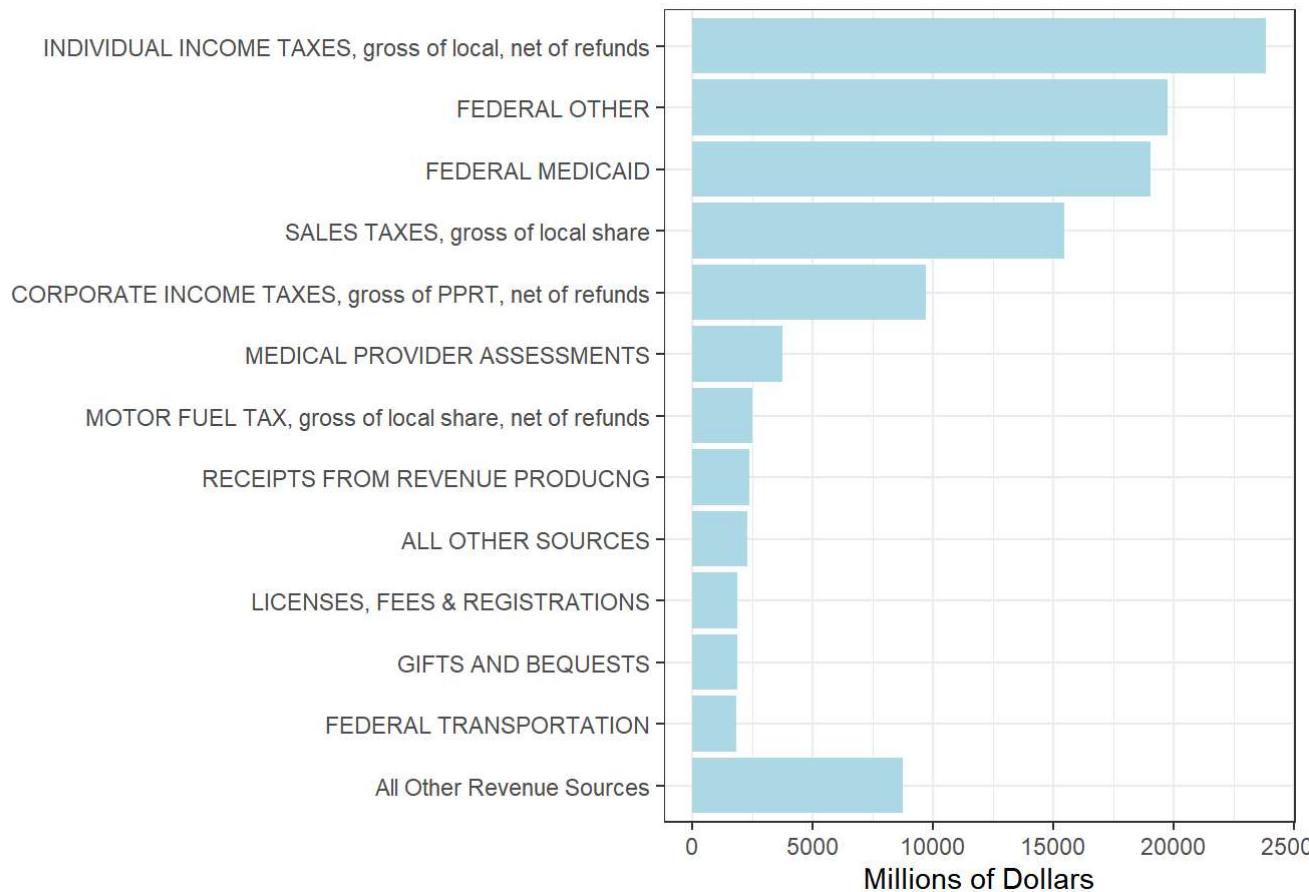
Expenditures for FY2022



[Hide](#)

```
rev_long %>%
  filter(Year == 2022) %>%
  mutate(rank = rank(Dollars),
        Category_name = ifelse(rank > 10, Category_name, 'All Other Revenue Sources')) %>%
  arrange(desc(Dollars)) %>%
  ggplot() +
  geom_col(aes(x = fct_reorder(Category_name, `Dollars`), y = `Dollars`), fill = "light blue") +
  coord_flip() +
  theme_bw() +
  labs(title = "Revenues for FY2022") +
  xlab("") +
  ylab("Millions of Dollars")
```

Revenues for FY2022

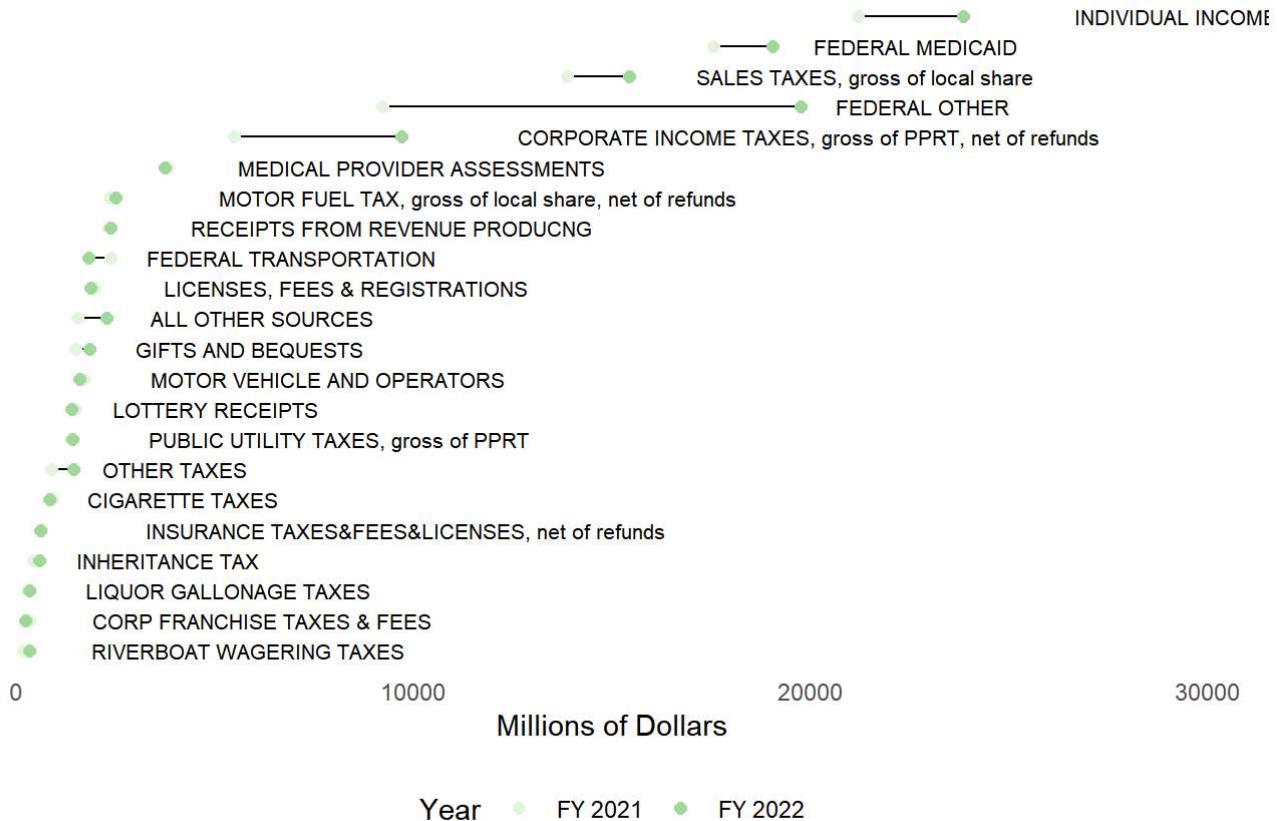


Changes in Categories - 2021 to 2022 Dot Plot Attempt:

[Hide](#)

```
rev_long %>%
  filter(Year == "2022" | Year == "2021") %>%
  mutate(Year = as.character(Year)) %>%
  ggplot(aes(x = Dollars, y = reorder(Category, Dollars))) +
  geom_line(aes(group = Category)) +
  geom_text(aes(x = ifelse(Year == "2022", as.numeric(Dollars), NA), label = ifelse(Year == "2022",
, Category_name, "")),
            hjust = -0.2,
            size = 2.8) +
  geom_point(aes(color = Year), size=2) +
  labs(title = "2021 to 2022 Change in Revenue", x = "Millions of Dollars" , y = "", caption = "") +
  scale_color_brewer(palette = "paired", labels = c("FY 2021", "FY 2022"))+
  theme_classic()+
  theme(
    legend.position = "bottom" ,
    axis.text.y = element_blank(),
    axis.ticks.y = element_blank(),
    axis.line.y.left = element_blank(),
    axis.line.x = element_blank(),
    axis.title.y = element_blank(),
    axis.ticks.x = element_blank())+
  scale_x_continuous(limits = c(0, 30000))
```

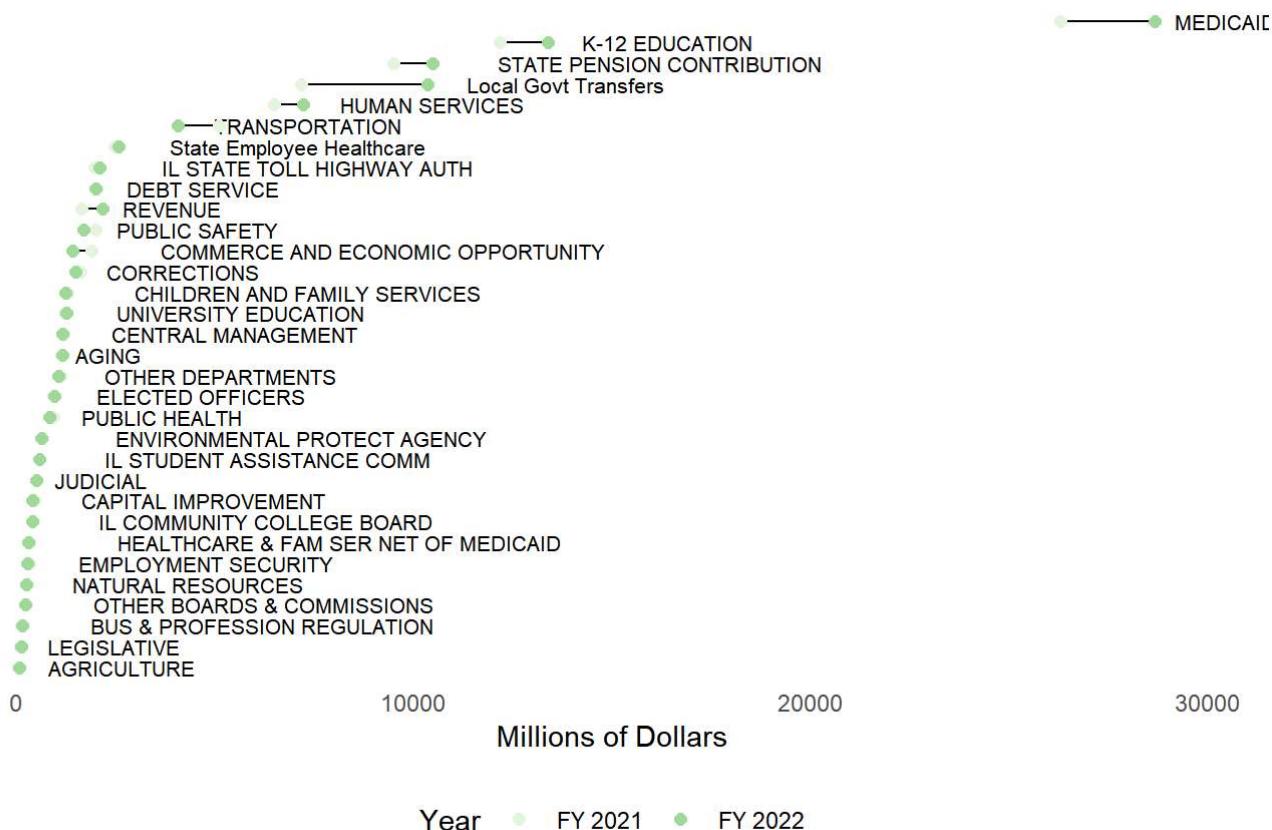
2021 to 2022 Change in Revenue



[Hide](#)

```
exp_long %>%
  filter(Year == "2022" | Year == "2021") %>%
  mutate(Year = as.character(Year)) %>%
  ggplot(aes(x = Dollars, y = reorder(Category, Dollars))) +
  geom_line(aes(group = Category)) +
  geom_text(aes(x = ifelse(Year == "2022", as.numeric(Dollars), NA), label = ifelse(Year == "2022",
, Category_name, "")),
            hjust = -0.2,
            size = 2.8) +
  geom_point(aes(color = Year), size=2) +
  labs(title = "2021 to 2022 Change in Expenditures", x = "Millions of Dollars" , y = "", caption =
 "") +
  scale_color_brewer(palette = "paired", labels = c("FY 2021", "FY 2022"))+
  theme_classic()+
  theme(
    legend.position = "bottom" ,
    axis.text.y = element_blank(),
    axis.ticks.y = element_blank(),
    axis.line.y.left = element_blank(),
    axis.line.x = element_blank(),
    axis.title.y = element_blank(),
    axis.ticks.x = element_blank())+
  scale_x_continuous(limits = c(0, 30000))
```

2021 to 2022 Change in Expenditures



CAGR / Growth

Each year, you will need to update the CAGR formulas!

`calc_cagr` is a function created for calculating the CAGRs for different spans of time.

[Hide](#)

```

# function for calculating the CAGR
calc_cagr <- function(df, n) {
  df <- exp_long %>%
    select(-type) %>%
    arrange(Category_name, Year) %>%
    group_by(Category_name) %>%
    mutate(cagr = ((`Dollars` / lag(`Dollars`, n)) ^ (1 / n)) - 1)

  return(df)
}

# This works for one variable at a time
cagr_24 <- calc_cagr(exp_long, 24) %>%
  # group_by(Category) %>%
  summarize(cagr_24 = round(sum(cagr*100, na.rm = TRUE), 2))

cagr23_precovid <- exp_long %>%
  filter(Year <= 2019) %>%
  calc_cagr(21) %>%
  summarize(cagr_21 = round(sum(cagr*100, na.rm = TRUE), 2))

cagr_10 <- calc_cagr(exp_long, 10) %>%
  filter(Year == 2022) %>%
  summarize(cagr_10 = case_when(Year == 2022 ~ round(sum(cagr*100, na.rm = TRUE), 2)))

cagr_5 <- calc_cagr(exp_long, 5) %>%
  filter(Year == 2022) %>%
  summarize(cagr_5 = case_when(Year == 2022 ~ round(sum(cagr*100, na.rm = TRUE), 2)))

cagr_3 <- calc_cagr(exp_long, 3) %>%
  filter(Year == 2022) %>%
  summarize(cagr_3 = case_when(Year == 2022 ~ round(sum(cagr*100, na.rm = TRUE), 2)))

cagr_2 <- calc_cagr(exp_long, 2) %>%
  filter(Year == 2022) %>%
  summarize(cagr_2 = case_when(Year == 2022 ~ round(sum(cagr*100, na.rm = TRUE), 2)))

cagr_1 <- calc_cagr(exp_long, 1) %>%
  filter(Year == 2022) %>%
  summarize(cagr_1 = case_when(Year == 2022 ~ round(sum(cagr*100, na.rm = TRUE), 2)))

CAGR_expenditures_summary <- data.frame(cagr_1, cagr_2, cagr_3, cagr_5, cagr_10, cagr_24 ) %>%
  select(-c(Category_name.1, Category_name.2, Category_name.3, Category_name.4, Category_name.5 )) %>%
  rename("Expenditure Category" = Category_name, "1 Year CAGR" = cagr_1, "2 Year CAGR" = cagr_2, "3 Year CAGR" = cagr_3, "5 Year CAGR" = cagr_5, "10 Year CAGR" = cagr_10, "24 Year CAGR" = cagr_24 )

CAGR_expenditures_summary %>%
  kbl(caption = "CAGR Calculations for Expenditure Categories") %>%
  kable_styling(bootstrap_options = c("striped"))

```

CAGR Calculations for Expenditure Categories

Expenditure Category	1 Year CAGR	2 Year CAGR	3 Year CAGR	5 Year CAGR	10 Year CAGR	24 Year CAGR
AGING	2.69	5.00	5.94	-1.34	3.97	7.34
AGRICULTURE	35.37	11.62	5.95	5.26	2.46	0.72
BUS & PROFESSION REGULATION	8.34	4.64	2.70	1.02	-3.10	0.21
CAPITAL IMPROVEMENT	-6.83	17.35	18.29	10.73	-3.77	2.07
CENTRAL MANAGEMENT	-2.75	6.11	12.66	2.75	4.85	5.06
CHILDREN AND FAMILY SERVICES	-3.90	0.55	2.79	3.08	0.51	-0.12
COMMERCE AND ECONOMIC OPPORTUNITY	-25.67	50.78	34.76	16.78	3.24	4.75
CORRECTIONS	-6.66	-0.99	-1.61	3.35	1.65	1.89
DEBT SERVICE	-0.83	1.59	-0.70	1.65	1.19	6.11
ELECTED OFFICERS	3.51	5.33	2.27	6.08	3.92	3.79
EMPLOYMENT SECURITY	-16.09	7.77	7.46	7.21	3.12	2.11
ENVIRONMENTAL PROTECT AGENCY	-3.33	-5.02	-8.45	-6.96	-0.02	3.06
HEALTHCARE & FAM SER NET OF MEDICAID	-5.67	3.07	-10.65	-0.95	-0.40	4.52
HUMAN SERVICES	11.16	10.19	9.01	6.13	3.29	2.62
IL COMMUNITY COLLEGE BOARD	-2.90	0.29	3.89	-1.70	-0.22	1.38
IL STATE TOLL HIGHWAY AUTH	7.06	4.69	6.28	3.57	11.64	7.54
IL STUDENT ASSISTANCE COMM	3.37	-0.84	2.09	-3.04	-1.38	0.89
JUDICIAL	-2.28	2.98	6.79	3.73	2.72	2.77
K-12 EDUCATION	9.87	8.79	7.95	6.52	4.10	4.13
LEGISLATIVE	19.56	11.86	10.73	7.38	2.39	3.20
Local Govt Transfers	44.14	26.60	16.64	9.88	6.39	4.65
MEDICAID	9.04	13.38	14.62	9.92	8.89	7.20
NATURAL RESOURCES	-0.37	1.58	0.48	4.51	2.52	1.33

Expenditure Category	1 Year CAGR	2 Year CAGR	3 Year CAGR	5 Year CAGR	10 Year CAGR	24 Year CAGR
OTHER BOARDS & COMMISSIONS	-1.48	7.80	2.01	2.18	-3.28	3.92
OTHER DEPARTMENTS	-3.11	4.69	8.49	7.91	3.94	4.23
PUBLIC HEALTH	-11.33	22.75	24.71	17.86	7.50	7.14
PUBLIC SAFETY	-14.34	7.63	19.57	15.99	8.16	5.96
REVENUE	31.81	40.59	55.83	36.04	16.28	7.18
State Employee Healthcare	4.20	-1.18	-2.88	-2.87	2.14	6.19
STATE PENSION CONTRIBUTION	10.41	8.45	8.91	7.58	8.80	10.70
TRANSPORTATION	-20.02	2.89	8.05	0.38	-0.57	3.10
UNIVERSITY EDUCATION	4.36	3.06	3.64	0.17	-0.93	-0.13

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```
# to have it as a csv, uncomment the line below
#write_csv(CAGR_expenditures_summary, "CAGR_expenditures_summary.csv")
```

[Hide](#)

```

calc_cagr <- function(df, n) {
  df <- rev_long %>%
    arrange(Category_name, Year) %>%
    group_by(Category_name) %>%
    mutate(cagr = ((Dollars / lag(Dollars, n)) ^ (1 / n)) - 1)

  return(df)
}

# This works for one variable at a time
cagr_24 <- calc_cagr(rev_long, 24) %>%
  # group_by(Category) %>%
  summarize(cagr_24 = round(sum(cagr*100, na.rm = TRUE), 2))

cagr_10 <- calc_cagr(rev_long, 10) %>%
  filter(Year == 2022) %>%
  summarize(cagr_10 = case_when(Year == 2022 ~ round(sum(cagr*100, na.rm = TRUE), 2)))

cagr_5 <- calc_cagr(rev_long, 5) %>%
  filter(Year == 2022) %>%
  summarize(cagr_5 = case_when(Year == 2022 ~ round(sum(cagr*100, na.rm = TRUE), 2)))

cagr_3 <- calc_cagr(rev_long, 3) %>%
  filter(Year == 2022) %>%
  summarize(cagr_3 = case_when(Year == 2022 ~ round(sum(cagr*100, na.rm = TRUE), 2)))

cagr_2 <- calc_cagr(rev_long, 2) %>%
  filter(Year == 2022) %>%
  summarize(cagr_2 = case_when(Year == 2022 ~ round(sum(cagr*100, na.rm = TRUE), 2)))

cagr_1 <- calc_cagr(rev_long, 1) %>%
  filter(Year == 2022) %>%
  summarize(cagr_1 = case_when(Year == 2022 ~ round(sum(cagr*100, na.rm = TRUE), 2)))

CAGR_revenue_summary <- data.frame(cagr_1, cagr_2, cagr_3, cagr_5, cagr_10, cagr_24) %>%
  select(-c(Category_name.1, Category_name.2, Category_name.3, Category_name.4, Category_name.5 )) %>%
  rename("Revenue Category" = Category_name, "1 Year CAGR" = cagr_1, "2 Year CAGR" = cagr_2, "3 Year CAGR" = cagr_3, "5 Year CAGR" = cagr_5, "10 Year CAGR" = cagr_10, "24 Year CAGR" = cagr_24 )

CAGR_revenue_summary %>%
  kbl(caption = "CAGR Calculations for Revenue Sources") %>%
  kable_styling(bootstrap_options = c("striped"))

```

CAGR Calculations for Revenue Sources

Revenue Category	1 Year CAGR	2 Year CAGR	3 Year CAGR	5 Year CAGR	10 Year CAGR	24 Year CAGR
ALL OTHER SOURCES	46.48	13.20	14.88	8.83	6.61	4.38
CIGARETTE TAXES	-8.25	-0.54	3.02	1.49	3.33	2.51

Revenue Category	1 Year CAGR	2 Year CAGR	3 Year CAGR	5 Year CAGR	10 Year CAGR	24 Year CAGR
CORP FRANCHISE TAXES & FEES	-32.40	1.21	-4.37	0.85	1.18	2.55
CORPORATE INCOME TAXES, gross of PPRT, net of refunds	76.66	72.77	38.19	32.31	13.59	7.70
FEDERAL MEDICAID	8.48	17.30	16.43	12.76	11.30	7.52
FEDERAL OTHER	114.47	42.66	49.24	27.19	11.91	7.17
FEDERAL TRANSPORTATION	-22.95	1.39	10.40	-2.73	-0.06	3.33
GIFTS AND BEQUESTS	23.76	42.11	18.49	10.46	10.65	11.43
INDIVIDUAL INCOME TAXES, gross of local, net of refunds	12.60	16.35	9.25	15.22	5.36	5.68
INHERITANCE TAX	35.98	48.20	16.36	18.47	10.12	3.74
INSURANCE TAXES&FEES&LICENSES, net of refunds	-3.42	12.76	5.20	2.79	3.20	6.56
LICENSES, FEES & REGISTRATIONS	-4.68	15.06	16.83	9.26	6.23	7.87
LIQUOR GALLONAGE TAXES	2.53	2.81	2.49	1.69	1.37	7.45
LOTTERY RECEIPTS	-6.17	9.62	1.63	2.27	0.90	2.15
MEDICAL PROVIDER ASSESSMENTS	-1.98	3.67	16.26	11.80	8.33	8.36
MOTOR FUEL TAX, gross of local share, net of refunds	6.12	4.36	23.16	13.42	6.98	2.78
MOTOR VEHICLE AND OPERATORS	-5.59	4.66	-0.04	0.15	0.64	3.21
OTHER TAXES	63.89	32.74	17.36	13.92	17.13	7.87
PUBLIC UTILITY TAXES, gross of PPRT	3.09	-0.43	-1.43	0.22	-0.48	0.70
RECEIPTS FROM REVENUE PRODUCNG	3.01	4.78	-2.68	1.45	3.49	5.07
RIVERBOAT WAGERING TAXES	80.77	-1.03	-8.90	-6.18	-4.20	1.75
SALES TAXES, gross of local share	11.29	12.22	7.40	6.27	4.43	3.23

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```
# to have it as a csv, uncomment the Line below
#write_csv(CAGR_revenue_summary, "CAGR_revenue_summary.csv")

rm(cagr_1, cagr_2, cagr_3, cagr_5, cagr_10, cagr_24)
```

Expenditure and Revenue Growth using a lag formula:

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```
exp_long %>%
  group_by(Category_name) %>%
  mutate(Growth = ((Dollars) - lag(Dollars))/lag(Dollars) *100) %>%
  summarize(Growth = round(mean(Growth, na.rm = TRUE), 2))
```

Category_name	Growth
	<dbl>
AGING	9.06
AGRICULTURE	1.73
BUS & PROFESSION REGULATION	0.95
CAPITAL IMPROVEMENT	16.31
CENTRAL MANAGEMENT	6.32
CHILDREN AND FAMILY SERVICES	-0.07
COMMERCE AND ECONOMIC OPPORTUNITY	13.54
CORRECTIONS	2.95
DEBT SERVICE	6.95
ELECTED OFFICERS	4.01

1-10 of 32 rows

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```
rev_long %>%
  group_by(Category_name) %>%
  mutate(Growth = ((Dollars) - lag(Dollars))/lag(Dollars) *100) %>%
  summarize(Growth = round(mean(Growth, na.rm = TRUE), 2))
```

Category_name	Growth
	<dbl>
ALL OTHER SOURCES	5.99
CIGARETTE TAXES	3.29
CORP FRANCHISE TAXES & FEES	3.62
CORPORATE INCOME TAXES, gross of PPRT, net of refunds	11.15
FEDERAL MEDICAID	8.27

Category_name	Growth
	<dbl>
FEDERAL OTHER	9.74
FEDERAL TRANSPORTATION	4.71
GIFTS AND BEQUESTS	14.60
INDIVIDUAL INCOME TAXES, gross of local, net of refunds	6.74
INHERITANCE TAX	8.18

1-10 of 22 rows

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Change from Previous Year

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```

revenue_change <- rev_long %>%
  select(-c(type,Category)) %>%
  filter(Year > 2020) %>%
  pivot_wider(names_from = Year , values_from = Dollars,   names_prefix = "Dollars_") %>%
  mutate(
    "FY 2022 Revenues ($ billions)" = round(Dollars_2022/1000, digits = 1),
#    "Change from 2021 to 2022" = round(Dollars_2022 - Dollars_2021, digits = 2),
    "Percent Change from 2021 to 2022" = round(((Dollars_2022 -Dollars_2021)/Dollars_2021*100),
digits = 2) %>%
  left_join(CAGR_revenue_summary, by = c("Category_name" = "Revenue Category")) %>%
  arrange(`FY 2022 Revenues ($ billions)`)%>%
#select(-c(Dollars_2021, Dollars_2021, `1 Year CAGR`:`10 Year CAGR`)) %>%
  rename( "Compound Annual Growth, 1998-2022*" = `24 Year CAGR`,
         "FY2022 Revenue Category" = Category_name ) %>%
  select(-c(Dollars_2021, Dollars_2022, `1 Year CAGR`:`10 Year CAGR`))

revenue_change %>%
  kbl(caption = "Yearly Change in Revenue") %>%
  kable_styling(bootstrap_options = c("striped"))

```

Yearly Change in Revenue

FY2022 Revenue Category	FY 2022 Revenues (\$ billions)	Percent Change from 2021 to 2022	Compound Annual Growth, 1998-2022*
INDIVIDUAL INCOME TAXES, gross of local, net of refunds	23.8	12.60	5.68
FEDERAL OTHER	19.8	114.47	7.17
FEDERAL MEDICAID	19.0	8.48	7.52
SALES TAXES, gross of local share	15.4	11.29	3.23

FY2022 Revenue Category	FY 2022 Revenues (\$ billions)	Percent Change from 2021 to 2022	Compound Annual Growth, 1998-2022*
CORPORATE INCOME TAXES, gross of PPRT, net of refunds	9.7	76.66	7.70
MEDICAL PROVIDER ASSESSMENTS	3.7	-1.98	8.36
MOTOR FUEL TAX, gross of local share, net of refunds	2.5	6.12	2.78
RECEIPTS FROM REVENUE PRODUCNG	2.4	3.01	5.07
ALL OTHER SOURCES	2.3	46.48	4.38
LICENSES, FEES & REGISTRATIONS	1.9	-4.68	7.87
GIFTS AND BEQUESTS	1.9	23.76	11.43
FEDERAL TRANSPORTATION	1.8	-22.95	3.33
MOTOR VEHICLE AND OPERATORS	1.6	-5.59	3.21
PUBLIC UTILITY TAXES, gross of PPRT	1.4	3.09	0.70
LOTTERY RECEIPTS	1.4	-6.17	2.15
OTHER TAXES	1.4	63.89	7.87
CIGARETTE TAXES	0.8	-8.25	2.51
INHERITANCE TAX	0.6	35.98	3.74
INSURANCE TAXES&FEES&LICENSES, net of refunds	0.6	-3.42	6.56
LIQUOR GALLONAGE TAXES	0.3	2.53	7.45
RIVERBOAT WAGERING TAXES	0.3	80.77	1.75
CORP FRANCHISE TAXES & FEES	0.2	-32.40	2.55

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```

expenditure_change <- exp_long %>%
  select(-c(type,Category)) %>%
  filter(Year > 2020) %>%
  pivot_wider(names_from = Year , values_from = Dollars, names_prefix = "Dollars_") %>%
  mutate("FY 2022 Expenditures ($ billions)" = round(Dollars_2022/1000, digits = 1),
# "Change from 2021 to 2022" = Dollars_2022 - Dollars_2021,
  "Percent Change from 2021 to 2022" = round((Dollars_2022 -Dollars_2021)/Dollars_2021*100, digits = 2))%>%
  left_join(CAGR_expenditures_summary, by = c("Category_name" = "Expenditure Category")) %>%
  arrange(`FY 2022 Expenditures ($ billions)`)%>%
  select(-c(Dollars_2022, Dollars_2021, `1 Year CAGR`:`10 Year CAGR`)) %>%
  rename( "Compound Annual Growth, 1998-2022*" = `24 Year CAGR`,
  "FY2022 Expenditure Category" = Category_name )

expenditure_change %>%
  kbl(caption = "Yearly Change in Expenditures") %>%
  kable_styling(bootstrap_options = c("striped"))

```

Yearly Change in Expenditures

FY2022 Expenditure Category	FY 2022 Expenditures (\$ billions)	Percent Change from 2021 to 2022	Compound Annual Growth, 1998-2022*
MEDICAID	28.7	9.04	7.20
K-12 EDUCATION	13.4	9.87	4.13
STATE PENSION CONTRIBUTION	10.5	10.41	10.70
Local Govt Transfers	10.3	44.14	4.65
HUMAN SERVICES	7.2	11.16	2.62
TRANSPORTATION	4.1	-20.02	3.10
State Employee Healthcare	2.6	4.20	6.19
REVENUE	2.2	31.81	7.18
IL STATE TOLL HIGHWAY AUTH	2.1	7.06	7.54
DEBT SERVICE	2.0	-0.83	6.11
PUBLIC SAFETY	1.7	-14.34	5.96
CORRECTIONS	1.5	-6.66	1.89
COMMERCE AND ECONOMIC OPPORTUNITY	1.4	-25.67	4.75

FY2022 Expenditure Category	FY 2022 Expenditures (\$ billions)	Percent Change from 2021 to 2022	Compound Annual Growth, 1998-2022*
CHILDREN AND FAMILY SERVICES	1.3	-3.90	-0.12
UNIVERSITY EDUCATION	1.3	4.36	-0.13
AGING	1.2	2.69	7.34
CENTRAL MANAGEMENT	1.2	-2.75	5.06
OTHER DEPARTMENTS	1.1	-3.11	4.23
ELECTED OFFICERS	1.0	3.51	3.79
PUBLIC HEALTH	0.8	-11.33	7.14
ENVIRONMENTAL PROTECT AGENCY	0.6	-3.33	3.06
IL STUDENT ASSISTANCE COMM	0.6	3.37	0.89
JUDICIAL	0.5	-2.28	2.77
IL COMMUNITY COLLEGE BOARD	0.4	-2.90	1.38
CAPITAL IMPROVEMENT	0.4	-6.83	2.07
NATURAL RESOURCES	0.3	-0.37	1.33
EMPLOYMENT SECURITY	0.3	-16.09	2.11
HEALTHCARE & FAM SER NET OF MEDICAID	0.3	-5.67	4.52
BUS & PROFESSION REGULATION	0.2	8.34	0.21
OTHER BOARDS & COMMISSIONS	0.2	-1.48	3.92
AGRICULTURE	0.1	35.37	0.72
LEGISLATIVE	0.1	19.56	3.20

Create summary file

Saves main items in one excel file named `summary_file.xlsx`. Delete `eval=FALSE` to run on local computer.

```
#install.packages("openxlsx")
library(openxlsx)

dataset_names <- list('rev_long' = rev_long, 'exp_long' = exp_long,
                      `Table 1` = expenditure_change, `Table 2` = revenue_change,
                      'Table 4.a' = CAGR_revenue_summary, 'Table 4.b' = CAGR_expenditures_summary,
                      'year_totals' = year_totals)

write.xlsx(dataset_names, file = 'summary_file_FY2022.xlsx')
```