

R4DS_Final

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```
#setting path and wd
```

```
getwd()
```

```
## [1] "/Users/efegulkan/R_files/r4ds_final-main"
```

```
#libraries
```

```
library(tidyverse)
library(readxl)
library(kableExtra)
library(scales)
```

```
#Importing data
```

```
dataset <- read_xlsx("xutum_data.xlsx")
```

```
dataset[,c(4:11)] <- sapply(dataset[,c(4:11)], as.numeric)
dataset$Dates <- as.character(dataset$Dates)
```

```
#Dividing by sectors and years
```

```
dataset %>%
  group_by(Dates)%>%
  group_split(Dates)%>%
  set_names((nm = unique(dataset$Dates))) -> yearly
```

```
dataset %>%
  group_by(Sector)%>%
  group_split(Sector)%>%
  set_names((nm = sort(unique(dataset$Sector)))) -> sectorly
```

```
##General Summaries
```

```
yearly_summary <- dataset%>%
  group_by(Dates)%>%
  summarise(avg_emp = round(mean(`Number of Employees`, na.rm = T),2),
            sd_emp = round(sd(`Number of Employees`,na.rm=T),2),
            avg_exp_per = mean(`Personnel Expense Per Employee`, na.rm = T),
```

```

      avg_profit = mean(`Profit Margin`, na.rm = T),
      avg_sales = mean(Sales, na.rm = T))%>%
mutate(emp_index = avg_emp/first(avg_emp),
      exp_index = avg_exp_per/first(avg_exp_per),
      profit_index = avg_profit/first(avg_profit),
      sales_index = avg_sales/first(avg_sales))

sectorly_summary <- dataset%>%
  group_by(Sector)%>%
  summarise(avg_emp = round(mean(`Number of Employees`, na.rm = T),2),
            sd_emp = round(sd(`Number of Employees`, na.rm=T),2),
            avg_exp_per = round(mean(`Personnel Expense Per Employee`, na.rm = T),2),
            avg_profit = round(mean(`Profit Margin`, na.rm = T),2),
            avg_sales = round(mean(Sales, na.rm = T),2))

all_summary <- dataset%>%
  group_by(Sector, Dates)%>%
  summarise(avg_emp = round(mean(`Number of Employees`, na.rm = T),2),
            avg_exp_per = mean(`Personnel Expense Per Employee`, na.rm = T),
            avg_profit = mean(`Profit Margin`, na.rm = T),
            avg_sales = mean(Sales, na.rm = T),
            avg_market_cap = mean(`Market Cap`, na.rm = T))

namean <- function(data){
  mean(data, na.rm = T)
}

difference <- dataset%>%
  filter(Dates %in% c("2015-12-31", "2021-12-31"))%>%
  pivot_wider(id_cols = Sector,
              values_from = c("Number of Employees", "Sales", "Profit Margin"),
              names_from = Dates,
              values_fn = namean)

difference <- difference %>%
  mutate(emp_change = 100*(`Number of Employees_2021-12-31` - `Number of Employees_2015-12-31`)/`Number of Employees_2015-12-31`,
         sales_change = 100*(`Sales_2021-12-31` - `Sales_2015-12-31`)/`Sales_2015-12-31`,
         profit_change = 100*(`Profit Margin_2021-12-31` - `Profit Margin_2015-12-31`)/`Profit Margin_2015-12-31`)

unl <- function(data){
  length(unique(data))
}

sector_firms <- aggregate(dataset$Firm, by = list(dataset$Sector), FUN = unl)
dates_firms <- aggregate(dataset$Firm, by = list(dataset$Dates), FUN = unl)

no_firms <- dataset%>%
  group_by(Sector) %>%
  summarise(number = length(unique(Firm)))

ratio <- prop.table(no_firms$number)*100

ratio_table <- cbind(no_firms, ratio)

```

Group.1	x
2015-12-31	406
2016-12-31	408
2017-12-31	408
2018-12-31	404
2019-12-31	397
2020-12-31	393
2021-12-31	369

Dates	avg_emp	sd_emp	avg_exp_per	avg_profit	avg_sales	emp_index	exp_index	profit_index	s
2015-12-31	2716.92	8141.46	140470.7	-35.90926	2321.607	1.0000000	1.000000	1.0000000	
2016-12-31	2686.43	8157.28	144148.6	-563.24627	2494.706	0.9887777	1.026183	15.6852647	
2017-12-31	2623.63	7995.05	143427.6	1489.53624	3038.747	0.9656633	1.021050	-41.4805588	
2018-12-31	2442.46	7803.98	166893.7	19.46442	3815.813	0.8989812	1.188103	-0.5420444	
2019-12-31	2731.63	8504.67	179087.8	-87.74947	4796.409	1.0054142	1.274912	2.4436444	
2020-12-31	2837.01	9127.57	216933.8	98.68740	4968.918	1.0442008	1.544335	-2.7482435	
2021-12-31	3097.61	9837.13	268444.2	201.41748	8248.793	1.1401182	1.911034	-5.6090676	

```

dates_firms %>%
  kbl() %>%
  kable_styling(bootstrap_options = c("striped", "hover"))

```

```

yearly_summary%>%
  kbl() %>%
  kable_styling(bootstrap_options = c("striped", "hover"))

```

```

sectorly_summary%>%
  kbl() %>%
  kable_styling(bootstrap_options = c("striped", "hover"))

```

```

difference%>%
  kbl() %>%
  kable_styling(bootstrap_options = c("striped", "hover"))

```

```

summary(dataset[,4:11])%>%
  kbl() %>%
  kable_styling(bootstrap_options = c("striped", "hover"))

```

```

ratio_table%>%
  kbl() %>%
  kable_styling(bootstrap_options = c("striped", "hover"))

```

#Comparasion of personnel expenses and employment

```

ylim.emp <- c(1000, 4000)
ylim.expens <- c(100000, 300000)

```

Sector	avg_emp	sd_emp
ACCOMMODATION AND FOOD SERVICE ACTIVITIES	1677.33	3127.8
ADMINISTRATIVE AND SUPPORT SERVICE ACTIVITIES	1070.46	3016.7
AGRICULTURE, FORESTRY AND FISHING	97.00	52.0
ARTS, ENTERTAINMENT AND RECREATION	347.57	196.5
CONSTRUCTION	3857.28	6927.3
ELECTRICITY, GAS, STEAM AND AIR CONDITIONING SUPPLY	1273.78	2707.2
FINANCIAL AND INSURANCE ACTIVITIES	3381.09	9927.2
HUMAN HEALTH AND SOCIAL WORK ACTIVITIES	5654.12	5255.4
INFORMATION AND COMMUNICATION	3445.77	8700.4
MANUFACTURING	2236.90	8238.1
MINING AND QUARRYING	1341.76	964.0
PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES	218.16	307.2
REAL ESTATE ACTIVITIES	85.58	152.2
TRANSPORTATION AND STORAGE	8153.67	10698.1
WATER SUPPLY; SEWERAGE, WASTE MANAGEMENT AND REMEDIATION ACTIVITIES	243.50	134.8
WHOLESALE AND RETAIL TRADE; REPAIR OF MOTOR VEHICLES AND MOTORCYCLES	6971.22	14153.0

Sector	Number of Employees
MANUFACTURING	
TRANSPORTATION AND STORAGE	
CONSTRUCTION	
FINANCIAL AND INSURANCE ACTIVITIES	
WHOLESALE AND RETAIL TRADE; REPAIR OF MOTOR VEHICLES AND MOTORCYCLES	
INFORMATION AND COMMUNICATION	
ELECTRICITY, GAS, STEAM AND AIR CONDITIONING SUPPLY	
MINING AND QUARRYING	
PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES	
REAL ESTATE ACTIVITIES	
ACCOMMODATION AND FOOD SERVICE ACTIVITIES	
HUMAN HEALTH AND SOCIAL WORK ACTIVITIES	
ARTS, ENTERTAINMENT AND RECREATION	
WATER SUPPLY; SEWERAGE, WASTE MANAGEMENT AND REMEDIATION ACTIVITIES	
ADMINISTRATIVE AND SUPPORT SERVICE ACTIVITIES	
AGRICULTURE, FORESTRY AND FISHING	

Number of Employees	EBITDA	Profit Margin	Sales	Market Cap	Personnel Expense
Min. : 1.0	Min. : -426.89	Min. : -181191.9	Min. : -10.8	Min. : 3.3	Min. : 0.000
1st Qu.: 66.5	1st Qu.: 7.48	1st Qu.: 0.5	1st Qu.: 71.9	1st Qu.: 124.9	1st Qu.: 4.228
Median : 319.0	Median : 43.81	Median : 6.4	Median : 321.9	Median : 456.4	Median : 22.405
Mean : 2735.7	Mean : 486.41	Mean : 159.0	Mean : 4278.5	Mean : 3011.6	Mean : 306.784
3rd Qu.: 1179.0	3rd Qu.: 195.03	3rd Qu.: 18.8	3rd Qu.: 1445.6	3rd Qu.: 1862.2	3rd Qu.: 107.062
Max. :105908.0	Max. :43946.57	Max. : 545549.8	Max. :346688.7	Max. :98560.0	Max. :17379.680
NA's :290	NA's :308	NA's :190	NA's :172	NA's :426	NA's :261

Sector	number	rat
ACCOMMODATION AND FOOD SERVICE ACTIVITIES	9	2.20588
ADMINISTRATIVE AND SUPPORT SERVICE ACTIVITIES	8	1.96078
AGRICULTURE, FORESTRY AND FISHING	2	0.49019
ARTS, ENTERTAINMENT AND RECREATION	5	1.22549
CONSTRUCTION	15	3.67647
ELECTRICITY, GAS, STEAM AND AIR CONDITIONING SUPPLY	14	3.43137
FINANCIAL AND INSURANCE ACTIVITIES	64	15.68627
HUMAN HEALTH AND SOCIAL WORK ACTIVITIES	3	0.73529
INFORMATION AND COMMUNICATION	20	4.90196
MANUFACTURING	186	45.58823
MINING AND QUARRYING	6	1.47058
PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES	4	0.98039
REAL ESTATE ACTIVITIES	32	7.84313
TRANSPORTATION AND STORAGE	10	2.45098
WATER SUPPLY; SEWERAGE, WASTE MANAGEMENT AND REMEDIATION ACTIVITIES	1	0.24509
WHOLESALE AND RETAIL TRADE; REPAIR OF MOTOR VEHICLES AND MOTORCYCLES	29	7.10784

```

secaxexps <- diff(ylim.emp)/diff(ylim.expens)
secax_exps <- ylim.emp[1] - secaxexps*ylim.expens[1]

ylim.prof <- c(-600,1800)
secaxprof <- diff(ylim.emp)/diff(ylim.prof)
secax_prof <- ylim.emp[1] - secaxprof*ylim.prof[1]

exp_vs_emp <- ggplot(yearly_summary, aes(x = Dates, group = 1))+
  geom_line(aes(y = avg_emp))+
  geom_line(aes(y = secax_exps+avg_exp_per*secaxexps), color = "red")+
  geom_point(aes(y = avg_emp),color = "navy")+
  geom_point(aes(y = secax_exps+avg_exp_per*secaxexps), color = "navy")+
  scale_y_continuous("Average Employee", sec.axis = sec_axis(~ (. - secax_exps)/secaxexps, name = "Av
  theme(axis.line.y.right = element_line(color = "red"),
        axis.ticks.y.right = element_line(color = "red"),
        axis.text.y.right = element_text(color = "red"))+
  labs(x = "Years")

profit_emp <- ggplot(yearly_summary, aes(x = Dates, group = 1))+
  geom_line(aes(y = avg_emp))+
  geom_line(aes(y = secax_prof+avg_profit*secaxprof), color = "red")+
  geom_point(aes(y = avg_emp),color = "navy")+
  geom_point(aes(y = secax_prof+avg_profit*secaxprof), color = "navy")+
  scale_y_continuous("Average Employee", sec.axis = sec_axis(~ (. - secax_prof)/secaxprof, name = "Av
  theme(axis.line.y.right = element_line(color = "red"),
        axis.ticks.y.right = element_line(color = "red"),
        axis.text.y.right = element_text(color = "red"))+
  labs(x = "Years",y="Average Profit Margin",title = "Change in Average Profit Margins of BIST TUM Fi

emp_box <- ggplot(dataset, aes(x = Sector))+
  geom_boxplot(aes(y = `Number of Employees`, color = Dates),show.legend = T, outlier.alpha = 0.2)+
  lims(y = c(0,30000))+

```

```

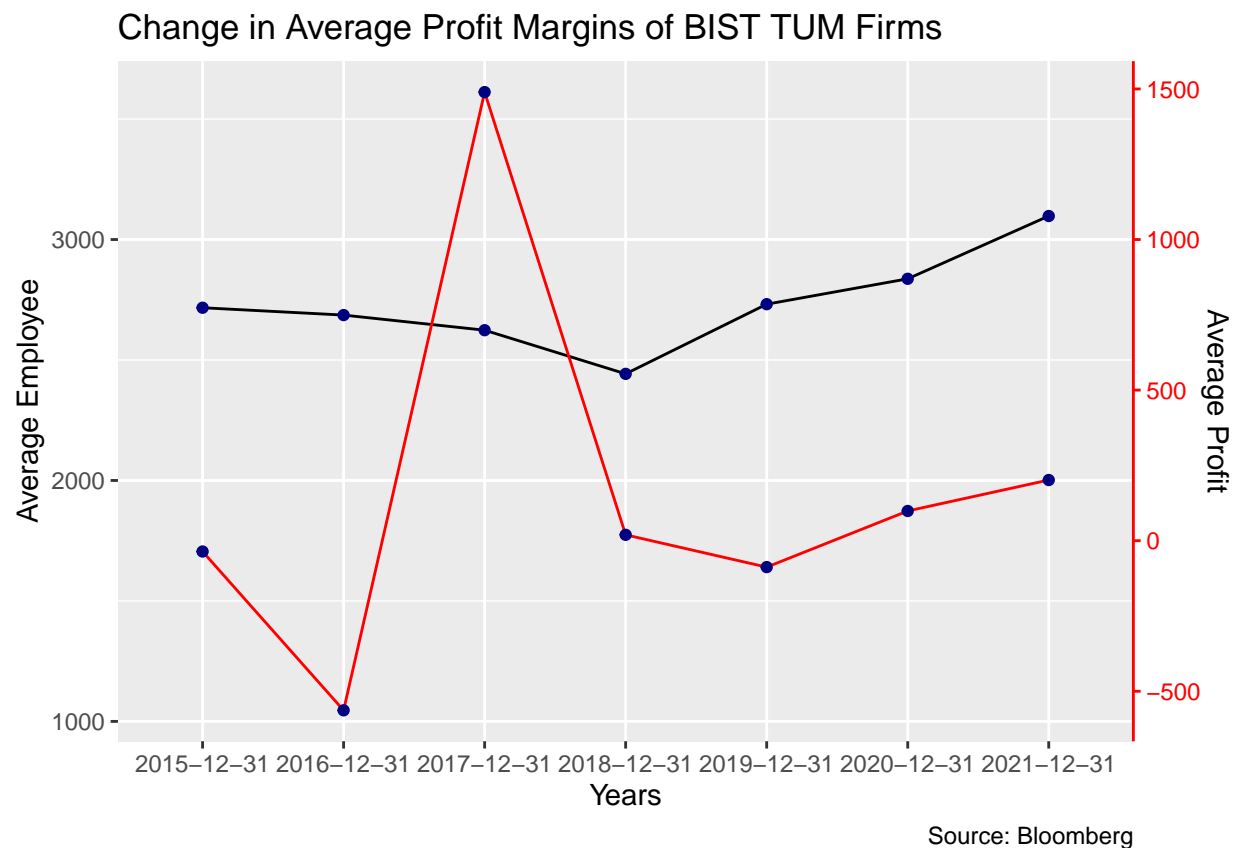
scale_x_discrete(labels = abbreviate)+
theme(axis.text.x = element_text(size= 8,angle = 45,hjust = 1, vjust = 1))

exp_emp_index <- ggplot(yearly_summary, aes(x = Dates, group = 1))+
  geom_line(aes(y = emp_index, color = "Employee Index"))+
  geom_line(aes(y=exp_index, color = "Average Personnel Expense Index"))+
  geom_point(aes(y = emp_index))+
  geom_point(aes(y = exp_index))+
  theme(legend.position = "bottom")+
  scale_color_manual(name = "Index",
                     values = c("red","black"),
                     labels = c("Average Personnel Expense Index","Employee Index"))+
  labs(x = "Years",
       y = "Index",
       title = "Index comparasion of Employee Number and Average Personnel Expense",caption = "Source

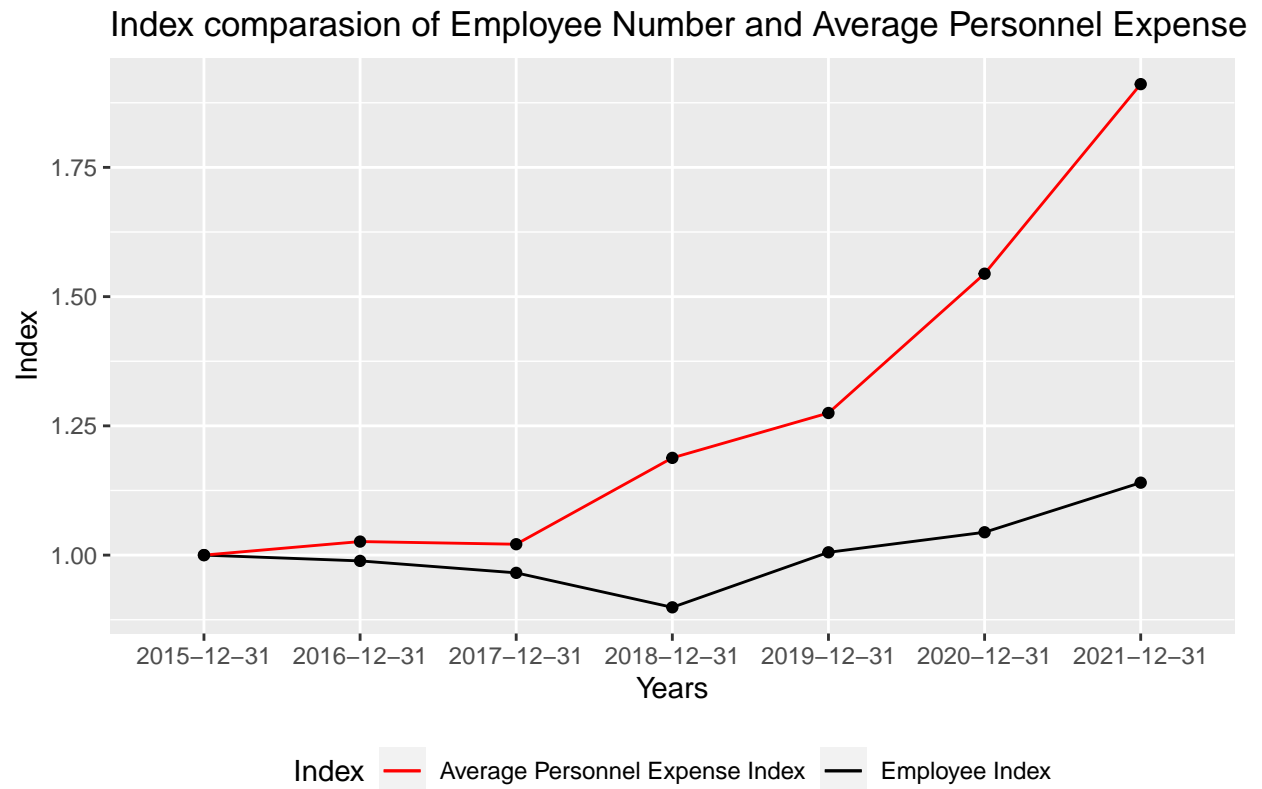
sales_change <- ggplot(yearly_summary, aes(x = Dates, group = 1))+
  geom_line(aes(y = avg_sales))+
  geom_point(aes(y = avg_sales))+
  labs(x = "Years",y="Average Sales (thousand)",title = "Change in Average Sales of BIST TUM Firms",caption = "Source: Bloomberg")

```

profit_emp



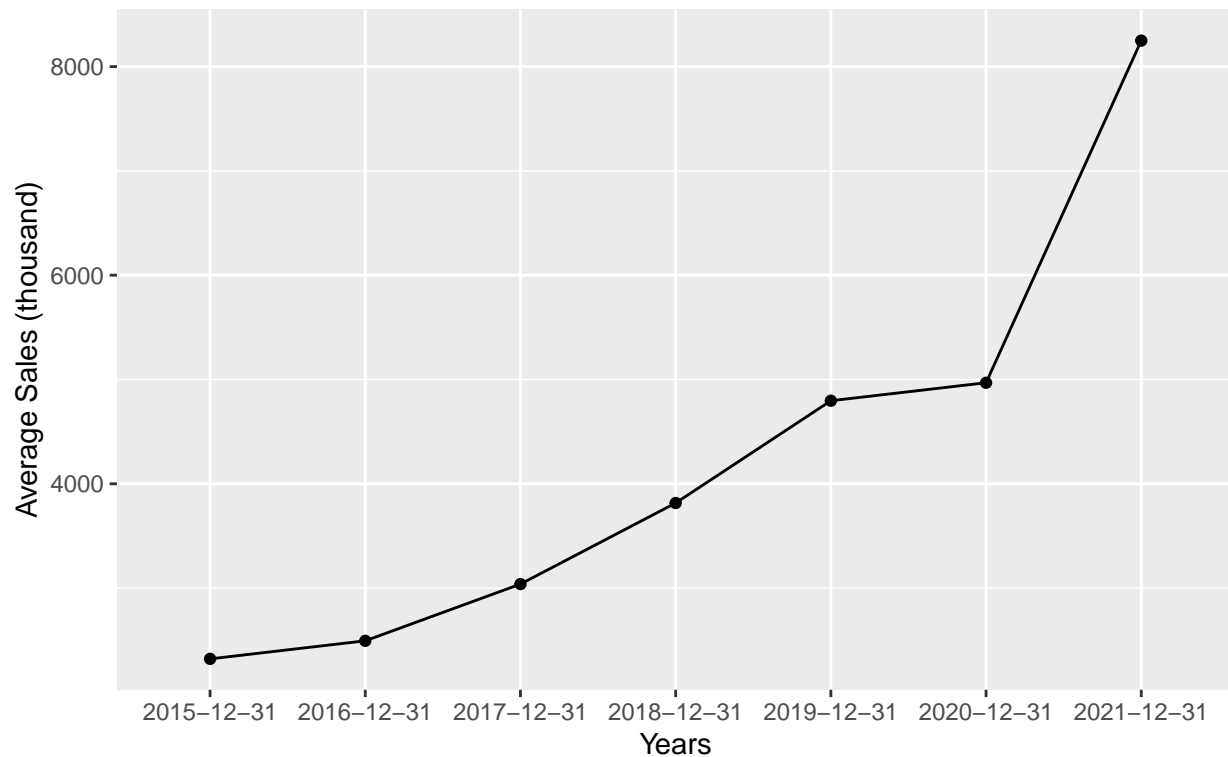
exp_emp_index



Source: Bloomberg

sales_change

Change in Average Sales of BIST TUM Firms



Source: Bloomberg

#Comparasion of Yearly Average Number of Employee by Sector

```
sectors1 <- c("ACCOMMODATION AND FOOD SERVICE ACTIVITIES","ADMINISTRATIVE AND SUPPORT SERVICE ACTIVITIES")
sectors2 <- c("INFORMATION AND COMMUNICATION","MANUFACTURING","MINING AND QUARRYING","PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES")

sec_emp1 <- ggplot(all_summary%>%
  filter(avg_market_cap<=1698.35))+
  geom_point(aes(x= Dates,
                 y = avg_emp,
                 color = Sector),show.legend = T)+
  geom_line(aes(x= Dates,
                y = avg_emp,
                color = Sector, group = Sector),show.legend = T)+
  theme(axis.text.x = element_text(angle = 15),
        legend.text = element_text(size = 8,vjust = 1, hjust = 0.5),
        legend.position = "right",
        legend.key.width = unit(0.1, "cm"),
        legend.key.size = unit(0.1, "cm"),
        legend.spacing = unit(0.01, "cm"))+
  scale_colour_viridis_d(option = "turbo",
                        end = 1,
                        labels = scales::label_wrap(25),
                        guide = guide_legend(nrow = 16))+
  lims(y= c(-1000,13000))+
  ylab("Average Number of Employee")+
```



```

labs(title = "Change of yearly average Number of Employees",
      subtitle = "Average Market Cap of Sector lower than the median 1.6 billion liras")

sec_emp2 <- ggplot(all_summary%>%
  filter(1698.35<avg_market_cap))+
  geom_point(aes(x= Dates,
    y = avg_emp,
    color = Sector),show.legend = T)+
  geom_line(aes(x= Dates,
    y = avg_emp,
    color = Sector, group = Sector),show.legend = T)+
  theme(axis.text.x = element_text(angle = 15),
    legend.text = element_text(size = 8,vjust = 1, hjust = 0.5),
    legend.position = "right",
    legend.key.width = unit(0.1, "cm"),
    legend.key.size = unit(0.1, "cm"),
    legend.spacing = unit(0.01, "cm"))+
  scale_colour_viridis_d(option = "turbo",
    end = 1,
    labels = scales::label_wrap(25),
    guide = guide_legend(nrow = 16))+
  lims(y= c(-1000,13000))+
  ylab("Average Number of Employee")+
  labs(title = "Change of yearly average Number of Employees",
    subtitle = "Average Market Cap of Sector higher than the median 1.6 billion liras")

sales_avg_s1 <- ggplot(all_summary %>%
  filter(Sector %in% sectors1))+
  geom_point(aes(x= Dates,
    y = log(avg_sales),
    color = Sector),show.legend = T)+
  geom_line(aes(x= Dates,
    y = log(avg_sales),
    color = Sector, group = Sector),show.legend = T)+
  theme(axis.text.x = element_text(angle = 15))+
  scale_colour_viridis_d(option = "turbo",
    end = 1,
    labels = scales::label_wrap(25),
    guide = guide_legend(nrow = 8))+
  labs(x = "Years",y = "Log of Average Sales",title = "Change of Average Sales by Sectors over Years")

sales_avg_s2 <- ggplot(all_summary %>%
  filter(Sector %in% sectors2))+
  geom_point(aes(x= Dates,
    y = log(avg_sales),
    color = Sector),show.legend = T)+
  geom_line(aes(x= Dates,
    y = log(avg_sales),
    color = Sector, group = Sector),show.legend = T)+
  theme(axis.text.x = element_text(angle = 15))+
  scale_colour_viridis_d(option = "turbo",
    end = 1,
    labels = scales::label_wrap(25),

```

```

                                guide = guide_legend(nrow = 8))+
  labs(x = "Years",y = "Log of Average Sales",title = "Change of Average Sales by Sectors over Years")

prof_date_s1 <- ggplot(all_summary %>%
  filter(!Sector %in% "ELECTRICITY, GAS, STEAM AND AIR CONDITIONING SUPPLY" & Sector %in% sectors2))+
  geom_point(aes(x= Dates,
    y = (avg_profit),
    color = Sector),show.legend = T)+
  geom_line(aes(x= Dates,
    y = (avg_profit),
    color = Sector, group = Sector),show.legend = T)+
  theme(axis.text.x = element_text(angle = 15),
  legend.text = element_text(size = 8,vjust = 0.5, hjust = 0))+
  scale_colour_viridis_d(option = "turbo",
    labels = scales::label_wrap(12),
    guide = guide_legend(nrow = 8))+
  labs(title = "Change of Average Profit Margins by Sectors over Years",subtitle = "Alphabetical First")
  lims(y = c(-100,200))

prof_date_s2 <- ggplot(all_summary %>%
  filter( Sector %in% sectors2))+
  geom_point(aes(x= Dates,
    y = (avg_profit),
    color = Sector),show.legend = T)+
  geom_line(aes(x= Dates,
    y = (avg_profit),
    color = Sector, group = Sector),show.legend = T)+
  theme(axis.text.x = element_text(angle = 15),
  legend.text = element_text(size = 8,vjust = 0.5, hjust = 0))+
  scale_colour_viridis_d(option = "turbo",
    labels = scales::label_wrap(20),
    guide = guide_legend(nrow = 8))+
  lims(y=c(-50,200))+
  labs(title = "Change of Average Profit Margins by Sectors over Years",subtitle = "Alphabetical Last")

sec_expense_out <- ggplot(all_summary %>%
  filter(Sector %in% c("FINANCIAL AND INSURANCE ACTIVITIES","ARTS, ENTERTAINMENT AND RECREATION")))+
  geom_point(aes(x= Dates,
    y = avg_exp_per,
    color = Sector),show.legend = T)+
  geom_line(aes(x= Dates,
    y = avg_exp_per,
    color = Sector, group = Sector),show.legend = T)+
  theme(axis.text.x = element_text(angle = 15))+
  scale_colour_viridis_d(option = "turbo",
    labels = scales::label_wrap(5),
    guide = guide_legend(nrow = 2))+
  labs(x = "Years",y="Average Personnel Expense",title = "Average Personnel Expense by Sectors over Years")

sec_expense_s1 <- ggplot(all_summary %>%
  filter(!Sector %in% c("FINANCIAL AND INSURANCE ACTIVITIES","ARTS, ENTERTAINMENT AND RECREATION")))+
  geom_point(aes(x= Dates,
    y = avg_exp_per,

```

```

        color = Sector),show.legend = T)+
geom_line(aes(x= Dates,
              y = avg_exp_per,
              color = Sector, group = Sector),show.legend = T)+
theme(axis.text.x = element_text(angle = 15),
      legend.text = element_text(size = 8,vjust = 0.5, hjust = 0),
      legend.position = "right",
      legend.key.width = unit(0.3, "cm"),
      legend.key.size = unit(0.8, "cm"),
      legend.spacing = unit(2, "cm"))+
  scale_colour_viridis_d(option = "turbo",
                        labels = scales::label_wrap(12),
                        guide = guide_legend(nrow = 8))+
labs(x = "Years",y="Average Personnel Expense",title = "Average Personnel Expense by Sectors over Y

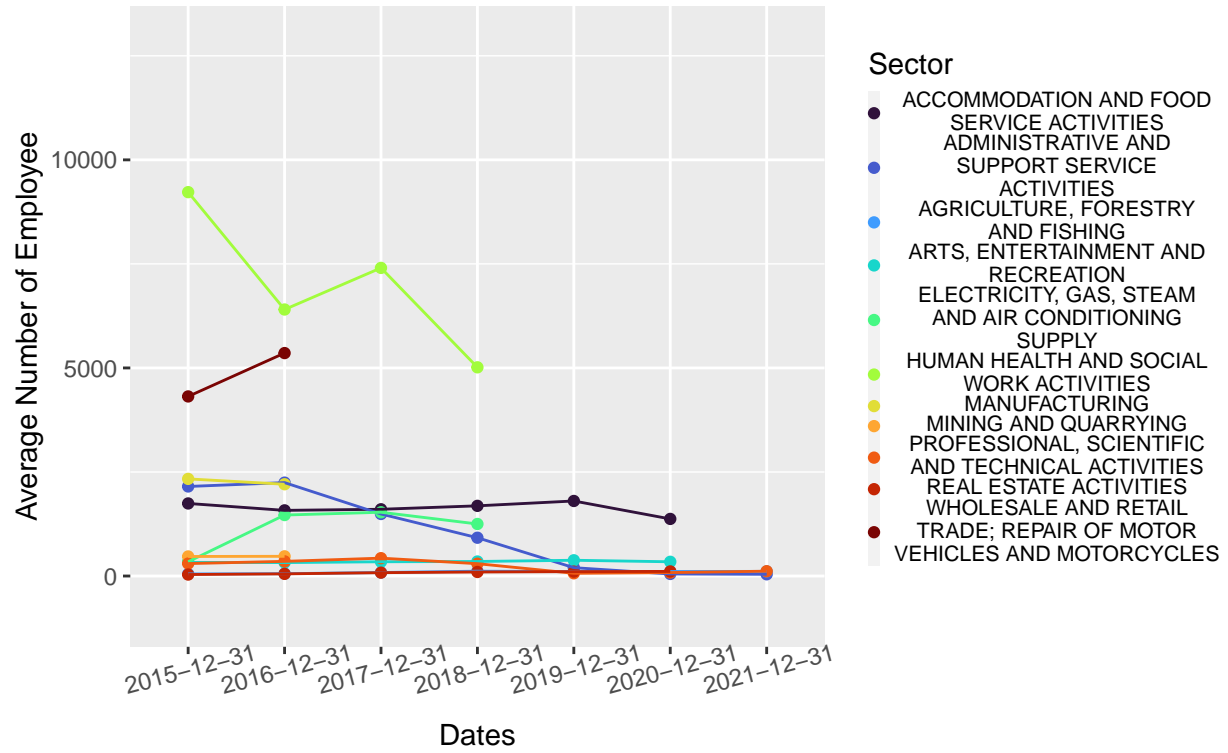
sec_expense_s2 <- ggplot(all_summary %>%
  filter(!Sector %in% c("FINANCIAL AND INSURANCE ACTIVITIES","ARTS, ENTERTAINMENT AND RECREATION
geom_point(aes(x= Dates,
              y = avg_exp_per,
              color = Sector),show.legend = T)+
geom_line(aes(x= Dates,
              y = avg_exp_per,
              color = Sector, group = Sector),show.legend = T)+
theme(axis.text.x = element_text(angle = 15),
      legend.text = element_text(size = 8,vjust = 0.5, hjust = 0),
      legend.position = "right",
      legend.key.width = unit(0.3, "cm"),
      legend.key.size = unit(0.8, "cm"),
      legend.spacing = unit(2, "cm"))+
  scale_colour_viridis_d(option = "turbo",
                        labels = scales::label_wrap(15),
                        guide = guide_legend(nrow = 8))+
labs(x = "Years",y="Average Personnel Expense",title = "Average Personnel Expense by Sectors over Y

sec_emp1

```

Change of yearly average Number of Employees

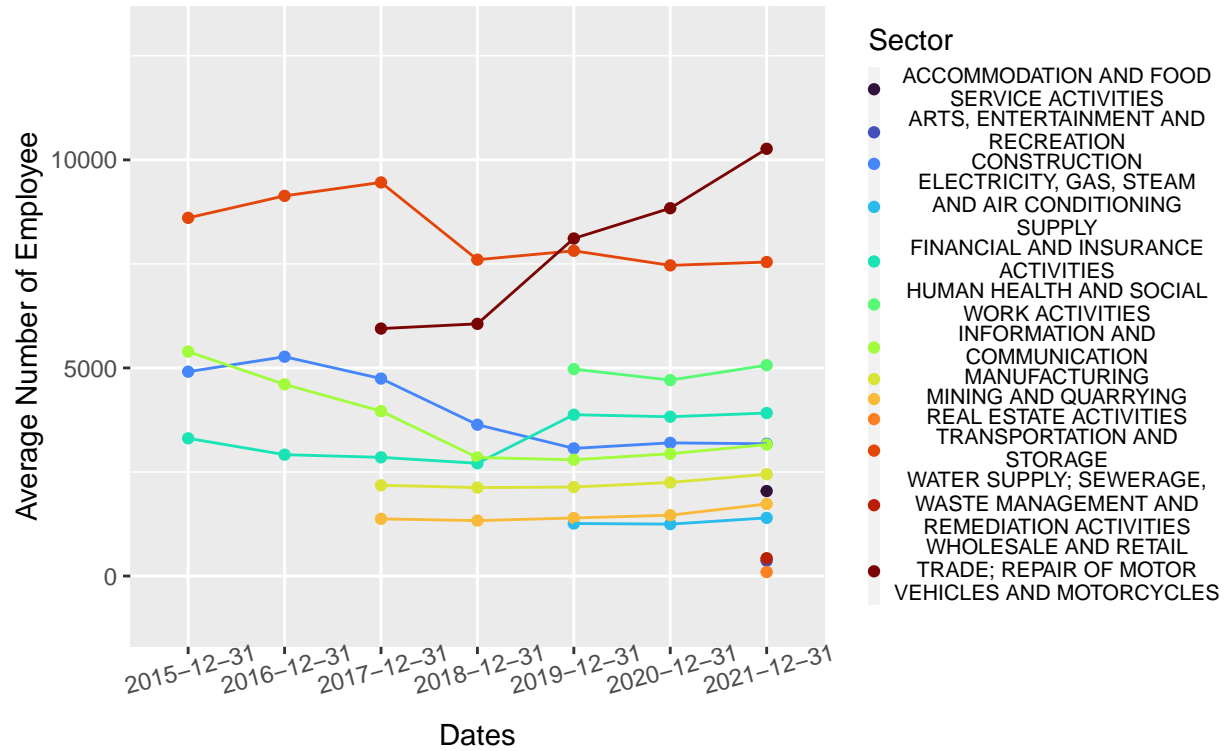
Average Market Cap of Sector lower than the median 1.6 billion liras



sec_emp2

Change of yearly average Number of Employees

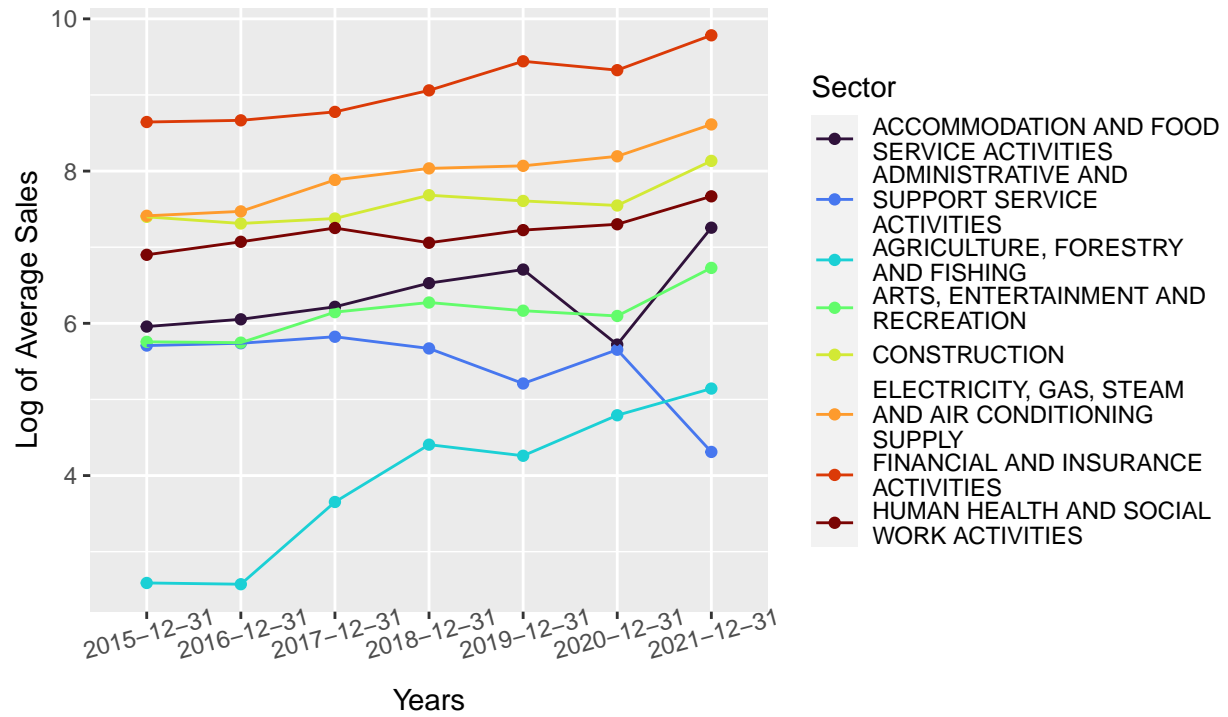
Average Market Cap of Sector higher than the median 1.6 billion liras



sales_avg_s1

Change of Average Sales by Sectors over Years

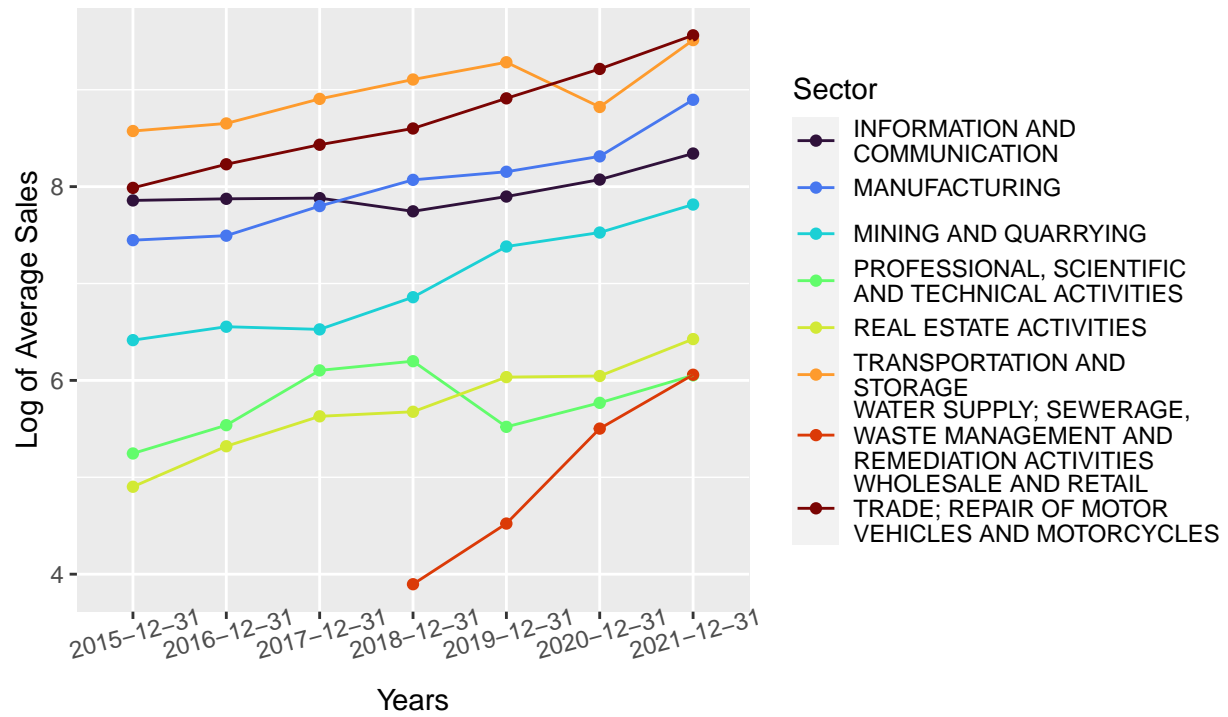
Alphabetical First 8 Sectors



sales_avg_s2

Change of Average Sales by Sectors over Years

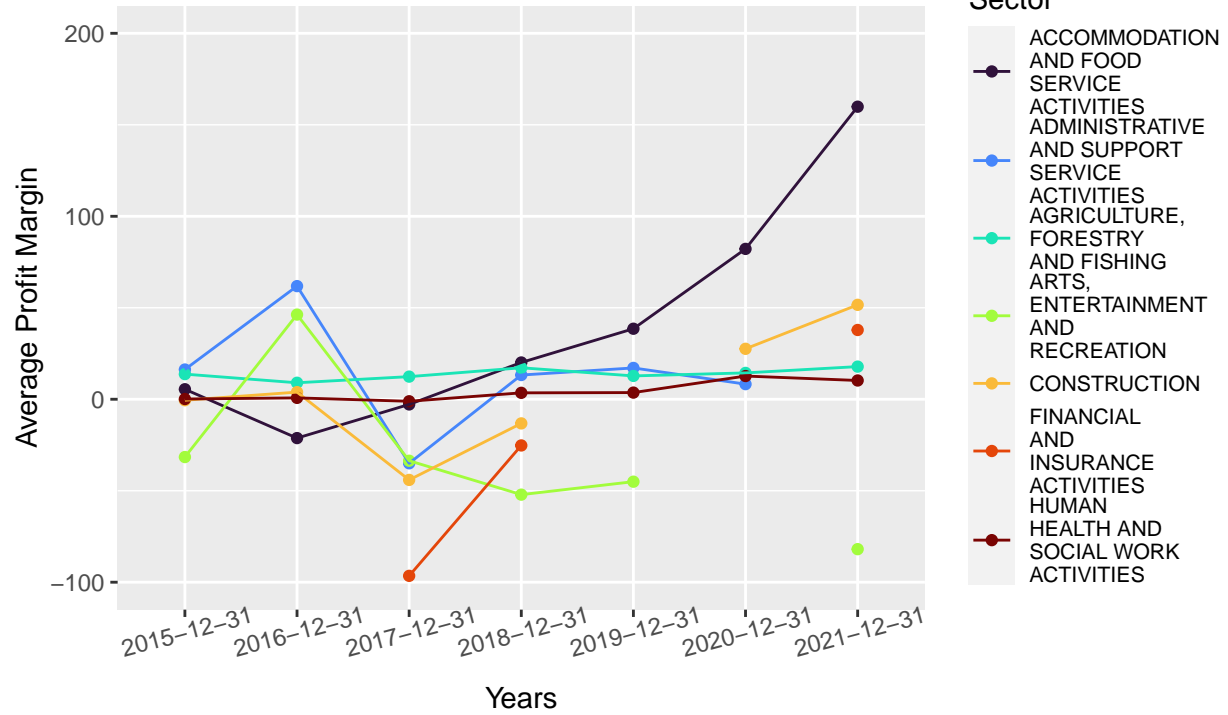
Alphabetical Latter 8 Sectors



prof_date_s1

Change of Average Profit Margins by Sectors over Years

Alphabetical First 8 Sectors & Outlier Electricity, Gas, Steam and AC Supply Excluded Sector

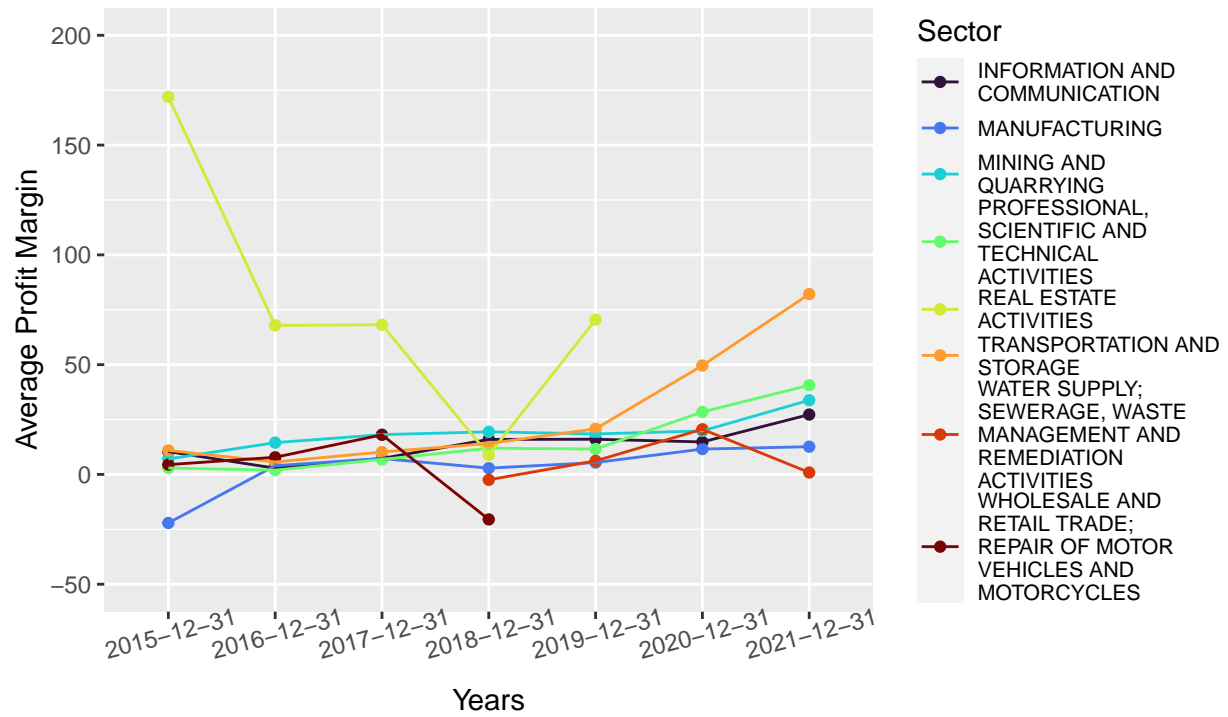


Source: Bloomberg

prof_date_s2

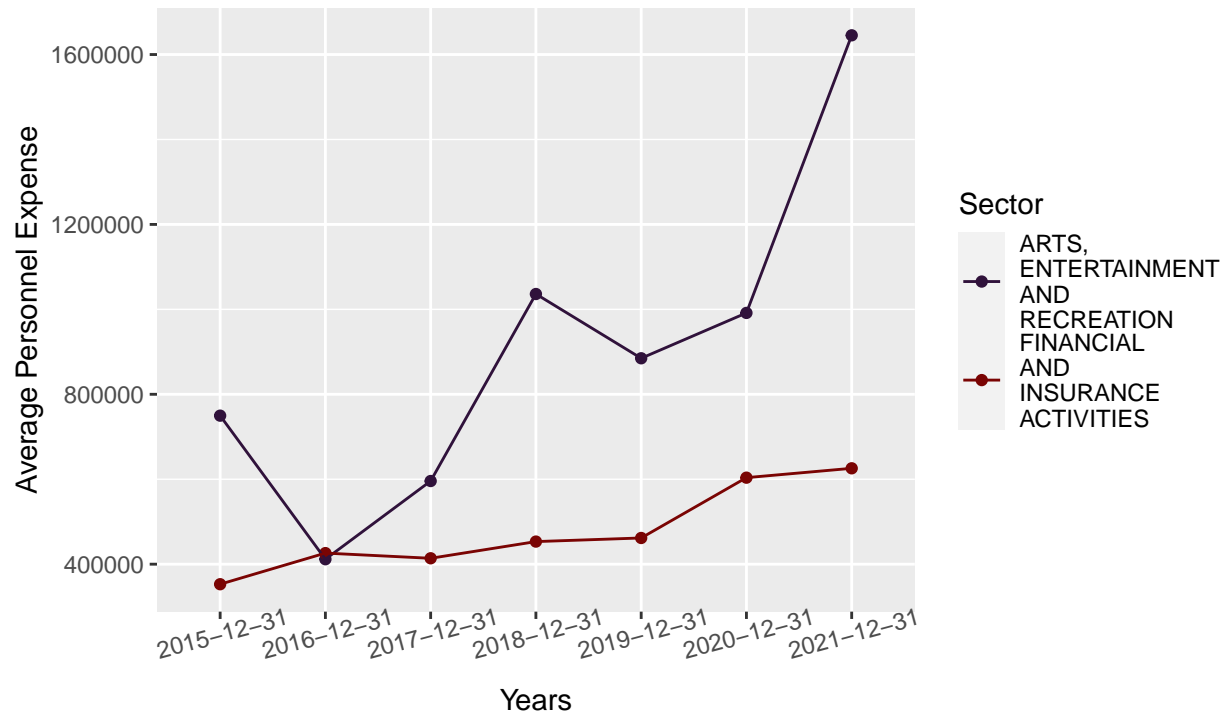
Change of Average Profit Margins by Sectors over Years

Alphabetical Latter 8 Sectors



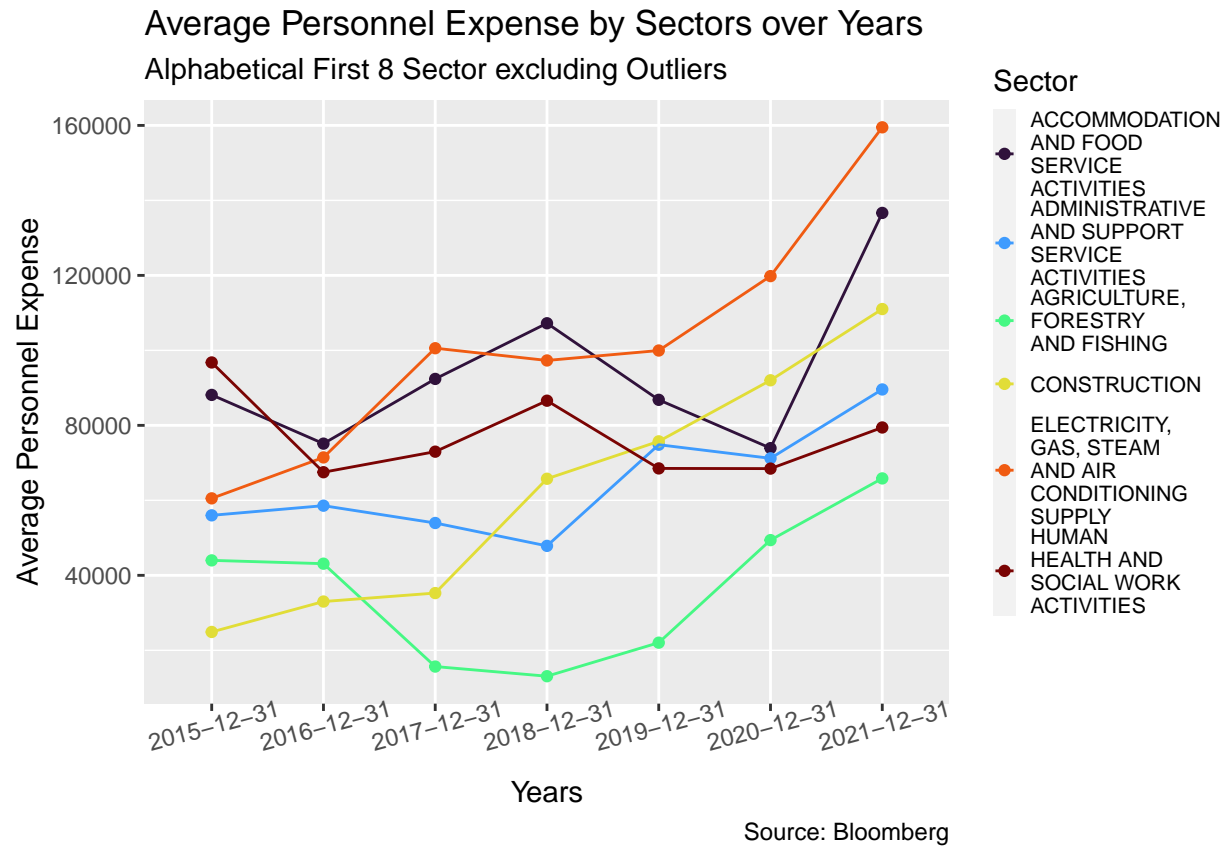
sec_expense_out

Average Personnel Expense by Sectors over Years
Outlier Sectors

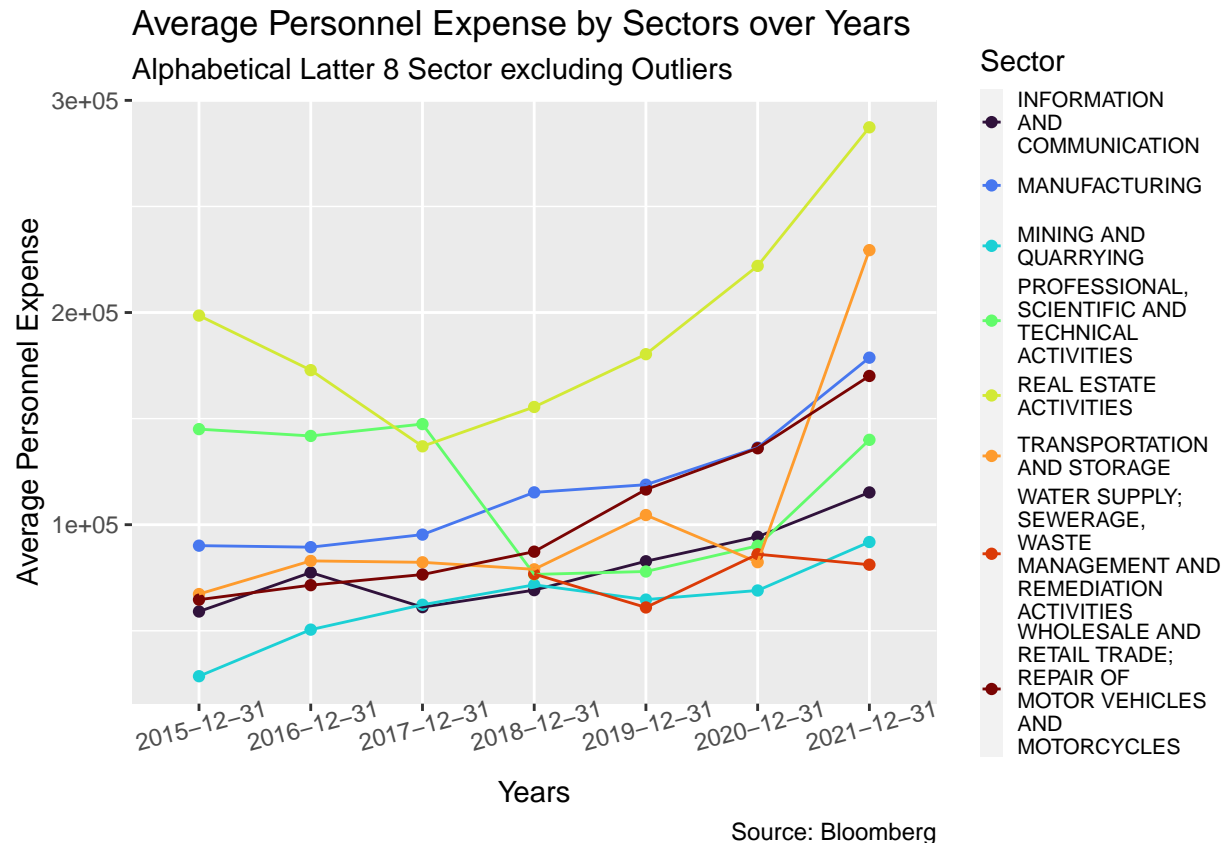


Source: Bloomberg

sec_expense_s1



sec_expense_s2



#Function for scatter plots of sales and profit

```
profit_emp_point <- function(date,emp_int){
  ggplot(dataset%>%
    filter(Dates %in% date),
    aes(x = `Number of Employees`,
        y = `Profit Margin`))+
    geom_point(aes(color = Sector))+
    theme(
      legend.text = element_text(size = 6,vjust = 0.5, hjust = 0.5, margin = margin(r = 11)),
      legend.position = "right",
      legend.key.width = unit(0.1, "cm"),
      legend.key.size = unit(0.1, "cm"),
      legend.spacing = unit(0.01, "cm"))+
      scale_colour_viridis_d(option = "turbo",
                             end = 1,
                             labels = scales::label_wrap(20),
                             guide = guide_legend(nrow = 16))+

      lims(x = emp_int,
           y = c(-50,200))+
      labs(title = "Profit - No. of Employee",
           subtitle = date)
}

sales_emp_point <- function(date,emp_int){
  ggplot(dataset%>%
```

```

    filter(Dates %in% date),
    aes(x = `Number of Employees`,
        y = log(Sales)))+
    geom_point(aes(color = Sector))+
  theme(
    legend.text = element_text(size = 6,vjust = 0.5, hjust = 0.5, margin = margin(r = 11)),
    legend.position = "right",
    legend.key.width = unit(0.1, "cm"),
    legend.key.size = unit(0.1, "cm"),
    legend.spacing = unit(0.01, "cm"))+
    scale_colour_viridis_d(option = "turbo",
                          end = 1,
                          labels = scales::label_wrap(20),
                          guide = guide_legend(nrow = 16))+

    lims(x = emp_int)+
    labs(title = "Sales - No. of Employee",
         subtitle = date)+
    ylab("log of Sales (thousand)")
}

```

Yearly profit plots

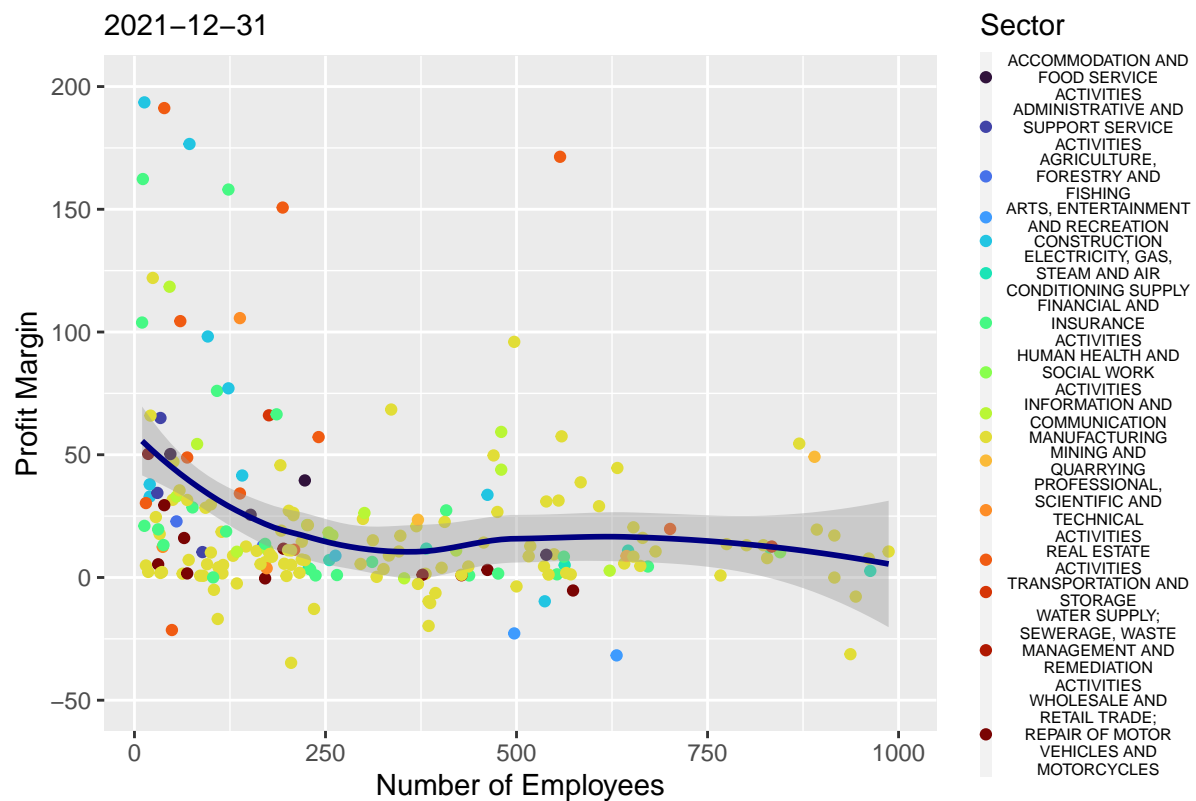
```

profit_emp_point("2021-12-31",c(10,1000))+
  geom_smooth(aes(x = `Number of Employees`,
                  y = `Profit Margin`,
                  se =T, color = "navy")

```

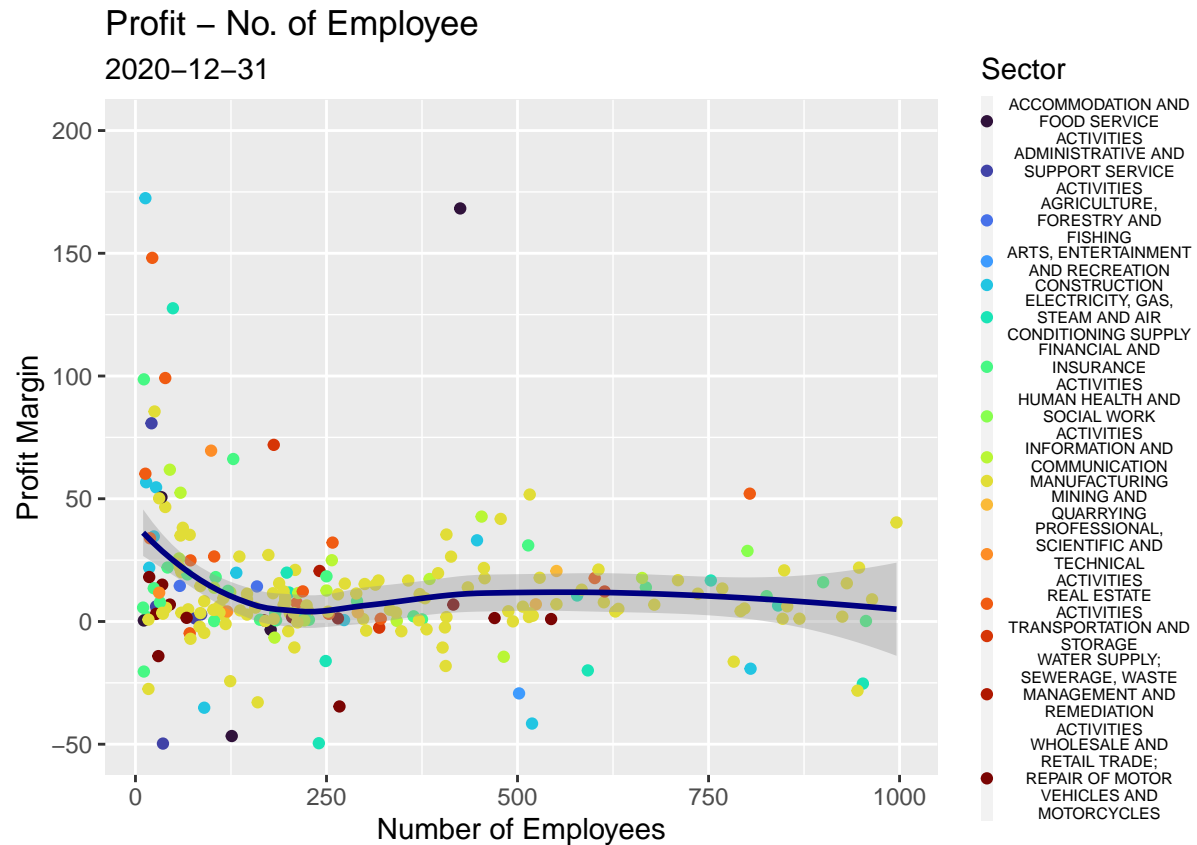
'geom_smooth()' using method = 'loess' and formula = 'y ~ x'

Profit – No. of Employee 2021-12-31



```
profit_emp_point("2020-12-31",c(10,1000))+
  geom_smooth(aes(x = `Number of Employees`,
                  y = `Profit Margin`,
                  se = T, color = "navy")
```

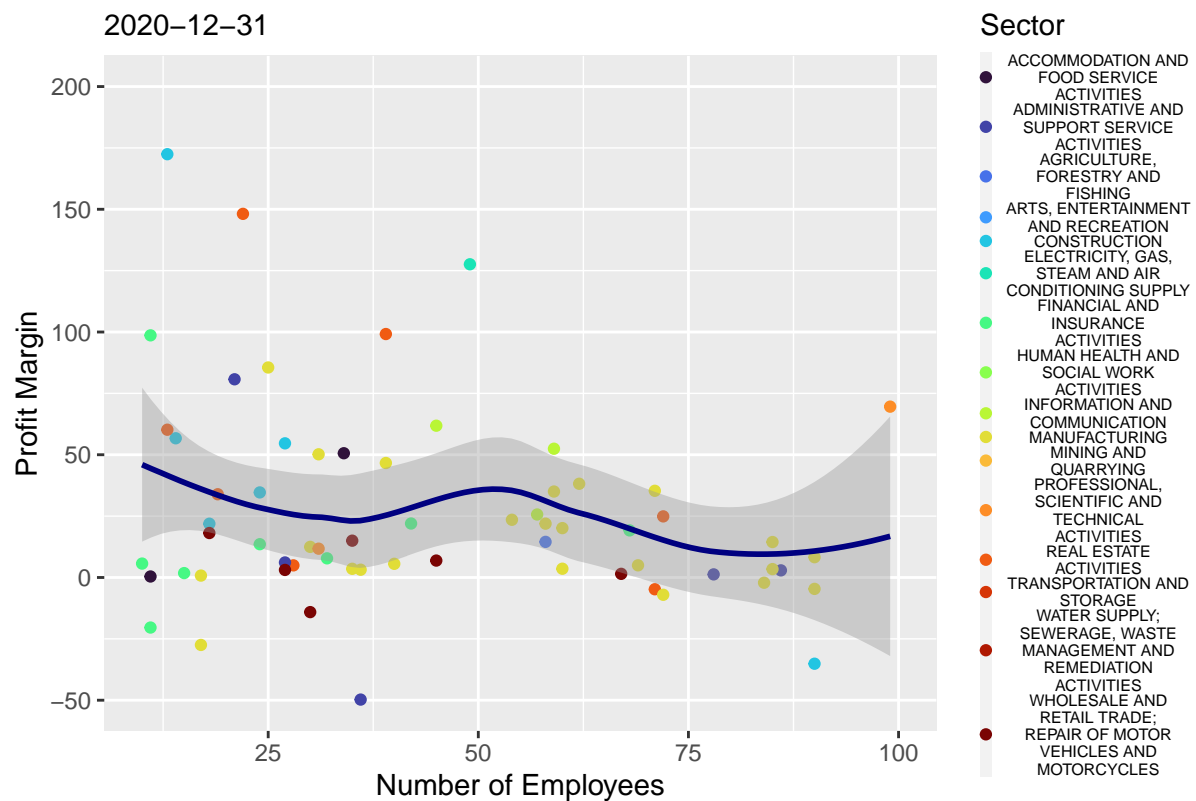
```
## 'geom_smooth()' using method = 'loess' and formula = 'y ~ x'
```



```
profit_emp_point("2020-12-31",c(10,100))+
  geom_smooth(aes(x = `Number of Employees`,
                  y = `Profit Margin`,
                  se = T, color = "navy"))
```

```
## 'geom_smooth()' using method = 'loess' and formula = 'y ~ x'
```

Profit – No. of Employee 2020-12-31



```
sales_emp_point("2019-12-31",c(10,2000))+
  geom_smooth(aes(x =`Number of Employees`,
                  y = log(Sales)),
              color = "#526788",se =T)
```

```
## 'geom_smooth()' using method = 'loess' and formula = 'y ~ x'
```


Sales – No. of Employee 2019–12–31

