Employees

April 16, 2023

[6]:
```r
library(tidyverse)
library(ggplot2)

# 1)
#read the data and import them in a data.frame
american <- read.table("american_airline_empl.txt", header = T)
delta <- read.table("delta_airline_empl.txt", header = T)
federal <- read.table("federal_express_empl.txt", header = T)
united <- read.table("united_airline_empl.txt", header = T)

# remove the "," as a thousand separator
delta$Full.time <- as.numeric(gsub(",", "", delta$Full.time))
american$Full.time <- as.numeric(gsub(",", "", american$Full.time))
federal$Full.time <- as.numeric(gsub(",", "", federal$Full.time))
united$Full.time <- as.numeric(gsub(",", "", united$Full.time))

american$Part.time <- as.numeric(gsub(",", "", american$Part.time))
delta$Part.time <- as.numeric(gsub(",", "", delta$Part.time))
federal$Part.time <- as.numeric(gsub(",", "", federal$Part.time))
united$Part.time <- as.numeric(gsub(",", "", united$Part.time))

american$Grand.Total <- as.numeric(gsub(",", "", american$Grand.Total))
delta$Grand.Total <- as.numeric(gsub(",", "", delta$Grand.Total))
federal$Grand.Total <- as.numeric(gsub(",", "", federal$Grand.Total))
united$Grand.Total <- as.numeric(gsub(",", "", united$Grand.Total))

head(american)
head(delta)
head(federal)
head(united)
```

A data.frame: 6 × 5

	Month <int>	Year <int>	Full.time <dbl>	Part.time <dbl>	Grand.Total <dbl>
1	1	1990	68137	9039	77176
2	2	1990	68725	9273	77998
3	3	1990	69509	9376	78885
4	4	1990	69713	9326	79039
5	5	1990	70376	9309	79685
6	6	1990	71258	9369	80627

A data.frame: 6 × 5

	Month <int>	Year <int>	Full.time <dbl>	Part.time <dbl>	Grand.Total <dbl>
1	1	1990	56340	4226	60566
2	2	1990	56413	4184	60597
3	3	1990	56700	4117	60817
4	4	1990	56630	4112	60742
5	5	1990	56932	4156	61088
6	6	1990	57478	4197	61675

A data.frame: 6 × 5

	Month <int>	Year <int>	Full.time <dbl>	Part.time <dbl>	Grand.Total <dbl>
1	1	1990	61305	23580	84885
2	2	1990	61485	23520	85005
3	3	1990	62244	22774	85018
4	4	1990	63511	22917	86428
5	5	1990	63044	23382	86426
6	6	1990	64704	23246	87950

A data.frame: 6 × 5

	Month <int>	Year <int>	Full.time <dbl>	Part.time <dbl>	Grand.Total <dbl>
1	1	1990	65664	5457	71121
2	2	1990	65839	5446	71285
3	3	1990	66070	5445	71515
4	4	1990	66779	5518	72297
5	5	1990	67217	5675	72892
6	6	1990	67924	5978	73902

[7]:
```r
# 2)
# create a new column "company" in each dataframe
american$company <- c(rep("american", nrow(american)))
delta$company <- c(rep("delta", nrow(delta)))
federal$company <- c(rep("federal", nrow(federal)))
united$company <- c(rep("united", nrow(united)))

# merge the dataframes
df <- rbind(american, delta, federal, united)

head(df)
```

A data.frame: 6 × 6

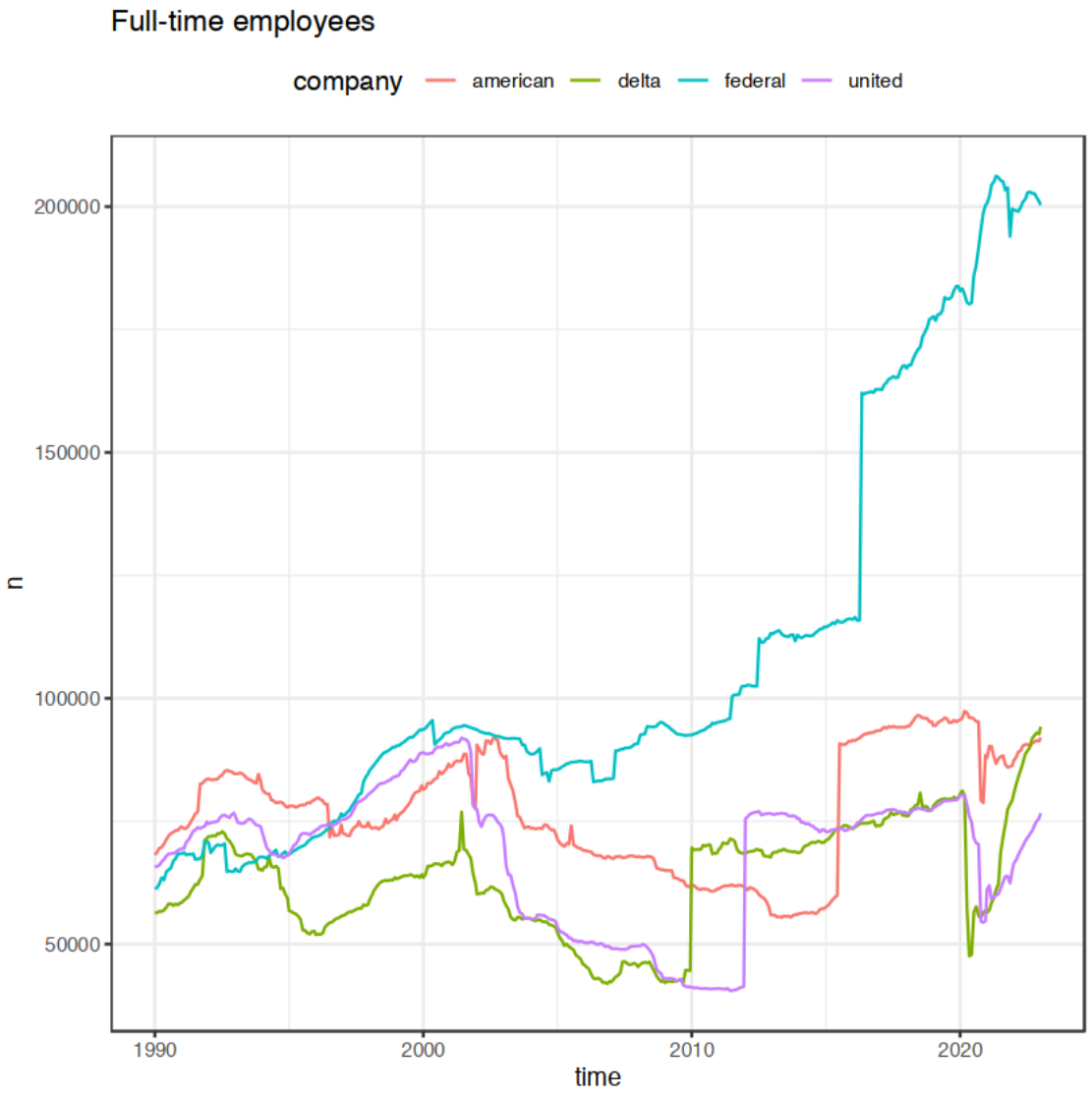
	Month <int>	Year <int>	Full.time <dbl>	Part.time <dbl>	Grand.Total <dbl>	company <chr>
1	1	1990	68137	9039	77176	american
2	2	1990	68725	9273	77998	american
3	3	1990	69509	9376	78885	american
4	4	1990	69713	9326	79039	american
5	5	1990	70376	9309	79685	american
6	6	1990	71258	9369	80627	american

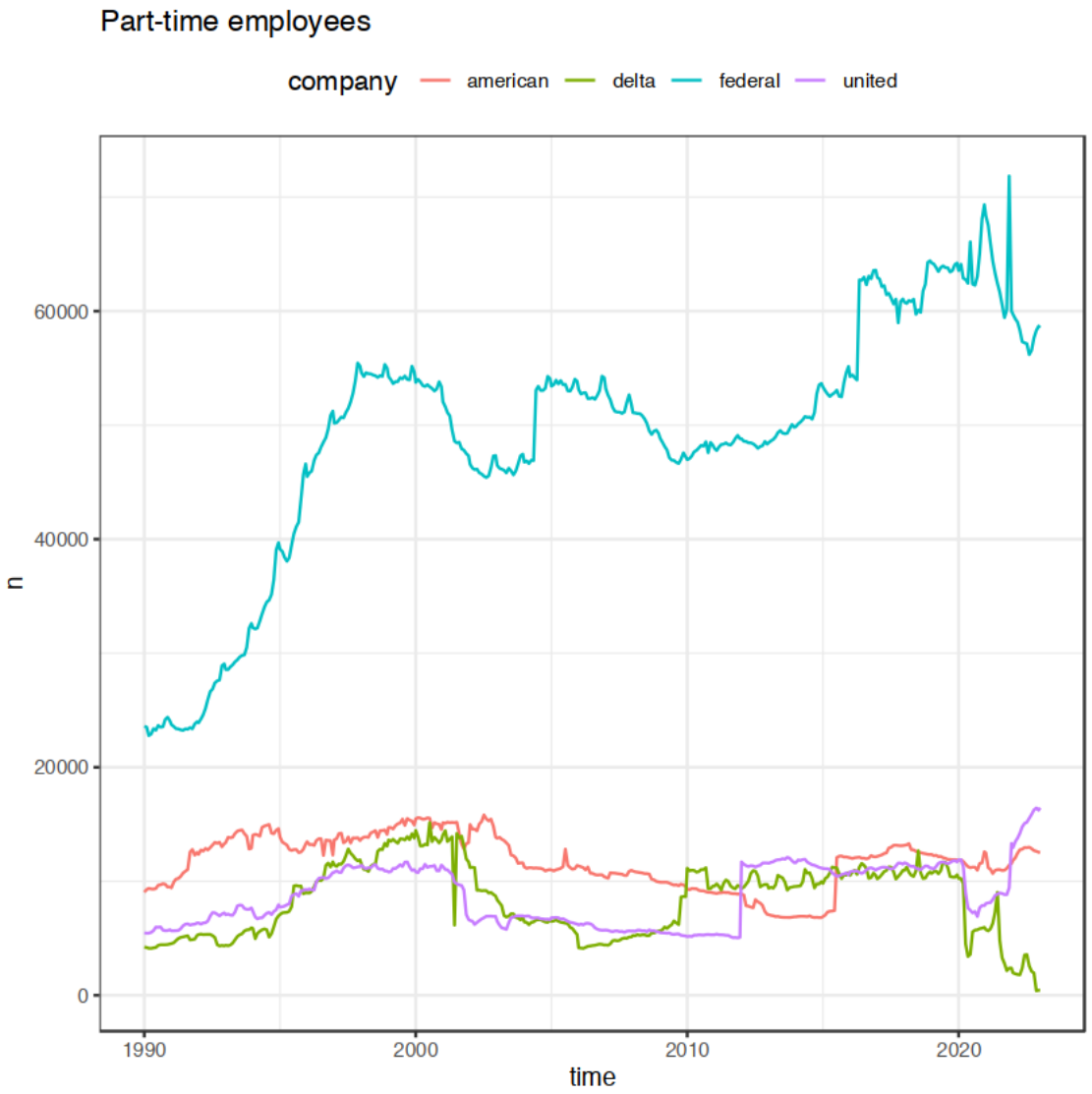
[8]:
```
# 3)
# create the date column
df$date <- as.Date(with(df, paste(Year, Month, Month, sep="-")), "%Y-%m-%d")

head(df)
```

A data.frame: 6 × 7

	Month <int>	Year <int>	Full.time <dbl>	Part.time <dbl>	Grand.Total <dbl>	company <chr>	date <date>
1	1	1990	68137	9039	77176	american	1990-01-01
2	2	1990	68725	9273	77998	american	1990-02-02
3	3	1990	69509	9376	78885	american	1990-03-03
4	4	1990	69713	9326	79039	american	1990-04-04
5	5	1990	70376	9309	79685	american	1990-05-05
6	6	1990	71258	9369	80627	american	1990-06-06

[9]:
```
# Create ggplot2 plot
ggp_ft <- ggplot(df, aes(date, Full.time, col = company)) + geom_line() +␣
 ↪theme_bw() + theme(legend.position = "top") + theme(legend.title =␣
 ↪element_text(size = 12, face = "bold")) + ggtitle("Full-time employees") +␣
 ↪labs(y = "n", x = "time")
ggp_pt <- ggplot(df, aes(date, Part.time, col = company)) + geom_line() +␣
 ↪theme_bw() + theme(legend.position = "top") + theme(legend.title =␣
 ↪element_text(size = 12, face = "bold")) + ggtitle("Part-time employees") +␣
 ↪labs(y = "n", x = "time")

ggp_ft
ggp_pt
```


Full-time employees
company
american
delta
federal
united
200000
150000
100000
50000
n
1990
2000
2010
2020
time



[34]:
```
# 4)
# create two dataframes with the month and year of minumun/maximum employees␣
 ↪for each company
min_empl <- df %>% group_by(company) %>% summarise(month = Month[which.
 ↪min(Grand.Total)], year = Year[which.min(Grand.Total)], .groups = 'drop')
max_empl <- df %>% group_by(company) %>% summarise(month = Month[which.
 ↪max(Grand.Total)], year = Year[which.max(Grand.Total)], .groups = 'drop')

min_empl
max_empl
```

A tibble: 4 × 3

company <chr>	month <int>	year <int>
american	9	2013
delta	11	2006
federal	1	1990
united	6	2011

A tibble: 4 × 3

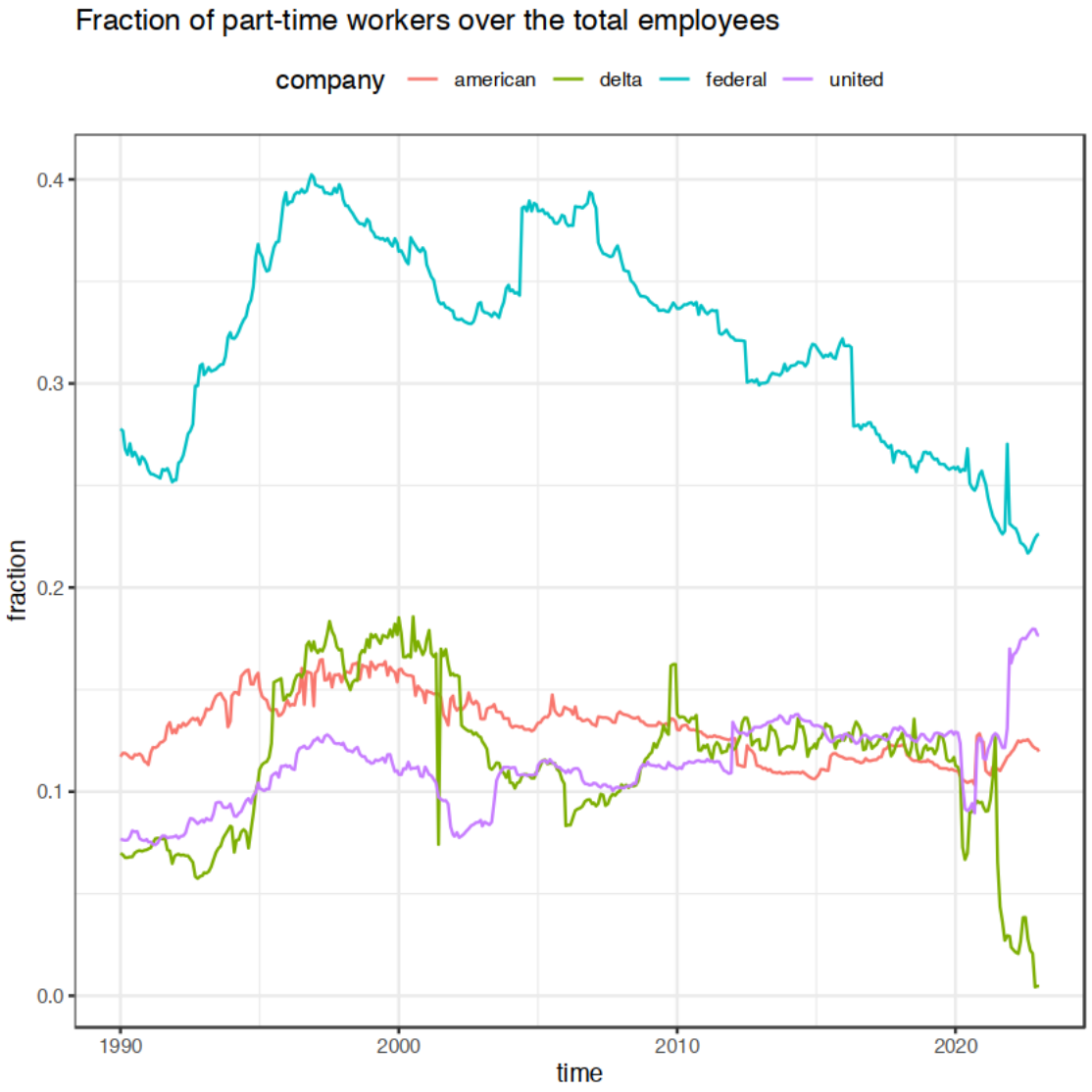
company <chr>	month <int>	year <int>
american	6	2018
delta	1	2023
federal	3	2021
united	3	2001

[13]:
```
print(paste("American airline reached the minimum number of employees on: ",␣
 ↪min_empl$month[1], "-", min_empl$year[1]))
print(paste("American airline reached the maximum number of employees on: ",␣
 ↪max_empl$month[1], "-", max_empl$year[1]))

print(paste("Delta airline reached the minimum number of employees on: ",␣
 ↪min_empl$month[2], "-", min_empl$year[2]))
print(paste("Delta airline reached the maximum number of employees on: ",␣
 ↪max_empl$month[2], "-", max_empl$year[2]))

print(paste("Federal airline reached the minimum number of employees on: ",␣
 ↪min_empl$month[3], "-", min_empl$year[3]))
print(paste("Federal airline reached the maximum number of employees on: ",␣
 ↪max_empl$month[3], "-", max_empl$year[3]))

print(paste("United airline reached the minimum number of employees on: ",␣
 ↪min_empl$month[4], "-", min_empl$year[4]))
print(paste("United airline reached the maximum number of employees on: ",␣
 ↪max_empl$month[4], "-", max_empl$year[4]))
```

```
[1] "American airline reached the minimum number of employees on:  9 - 2013"
[1] "American airline reached the maximum number of employees on:  6 - 2018"
[1] "Delta airline reached the minimum number of employees on:  11 - 2006"
[1] "Delta airline reached the maximum number of employees on:  1 - 2023"
[1] "Federal airline reached the minimum number of employees on:  1 - 1990"
[1] "Federal airline reached the maximum number of employees on:  3 - 2021"
[1] "United airline reached the minimum number of employees on:  6 - 2011"
[1] "United airline reached the maximum number of employees on:  3 - 2001"
```

[39]:
```
# 5)
# create a new column "fraction" in the dataframe
df$fraction <- df$Part.time / df$Grand.Total
```

```
# create ggplot2 plot
ggp_frac <- ggplot(df, aes(date, fraction, col = company)) + geom_line() +␣
 ↪theme_bw() + theme(legend.position = "top") + theme(legend.title =␣
 ↪element_text(size=12, face = "bold")) + ggtitle("Fraction of part-time␣
 ↪workers over the total employees") + labs(y = "fraction", x = "time")

ggp_frac
```



[ ]:
```
# 6)
```

We can observe that the number of full-time workers is increasing since 2019, and the number of part-time workers is quite constant. The fraction of part-time employees over the total, in fact is decreasing, except for united airlines. The impact of Covid-19 can be seen in the trend of the

number of full-time workers: in the first period of 2020 the number of employees decreased.