

GGally::ggduo plot matrix for two grouped data

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About myself

- **Purdue University**

- 4th Year PhD Candidate in Statistics
- Research in large data visualization using R - www.tessera.io
 - Dr. William Cleveland and Dr. Ryan Hafen

- Metamarkets.com - 1.5 years

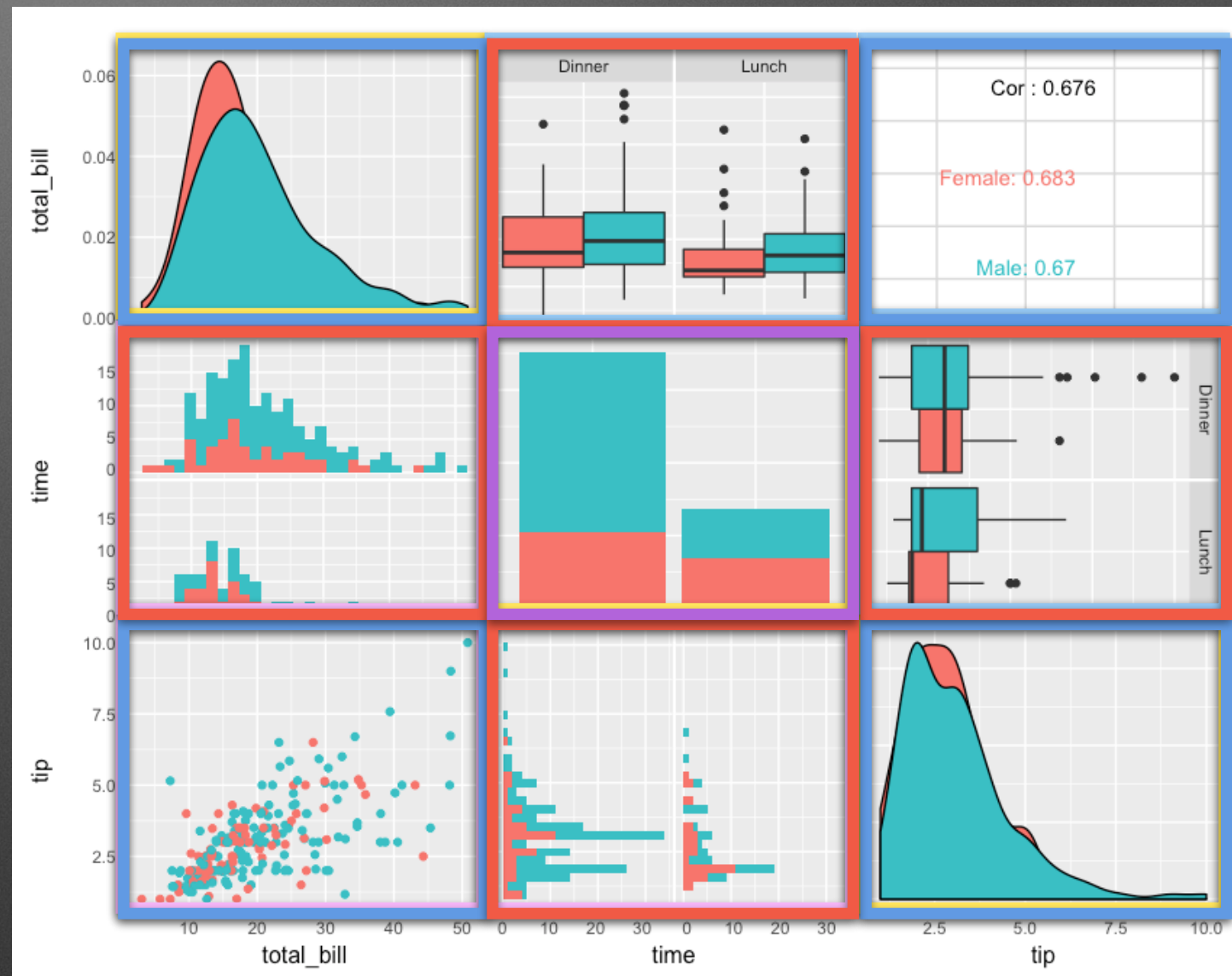
- Front end engineer - coffee script / node.js

- **Iowa State University**

- B.S. in Computer Engineering
- Research in statistical data visualization with R
 - Dr. Di Cook, Dr. Hadley Wickham, and Dr. Heike Hofmann

GGally::ggpairs

- Emerson, Green, Schloerke, Crowley, Cook, Hofmann, Wickham. “The Generalized Pairs Plot.” *JCGS*, vol. 22, no. 1, pp. 79-91, 2012.
- Complete pairwise plot matrix
 - A, B, C vs. A, B, C
- Three “matrix” sections:
 - upper, lower, diag
- Three main section types:
 - continuous, combo, discrete
- Produces a ggmatrix object



```
pm <- ggpairs(  
  tips, c(1,2,6),  
  mapping = aes(color = sex)  
); pm
```


GGally: : ggmatrix structure

- Generic plot matrix with fine tune control of
 - Bottom and left axis labels on outer layer of plots
 - Overall X and Y axis titles and plot matrix title
- May have a variable number of rows (n) and columns (m)
- Contains a list made of
 - (custom) ggplot2 objects
 - Functions that will evaluate with the supplied data
- Allows for many plots ($n*m$) with large data

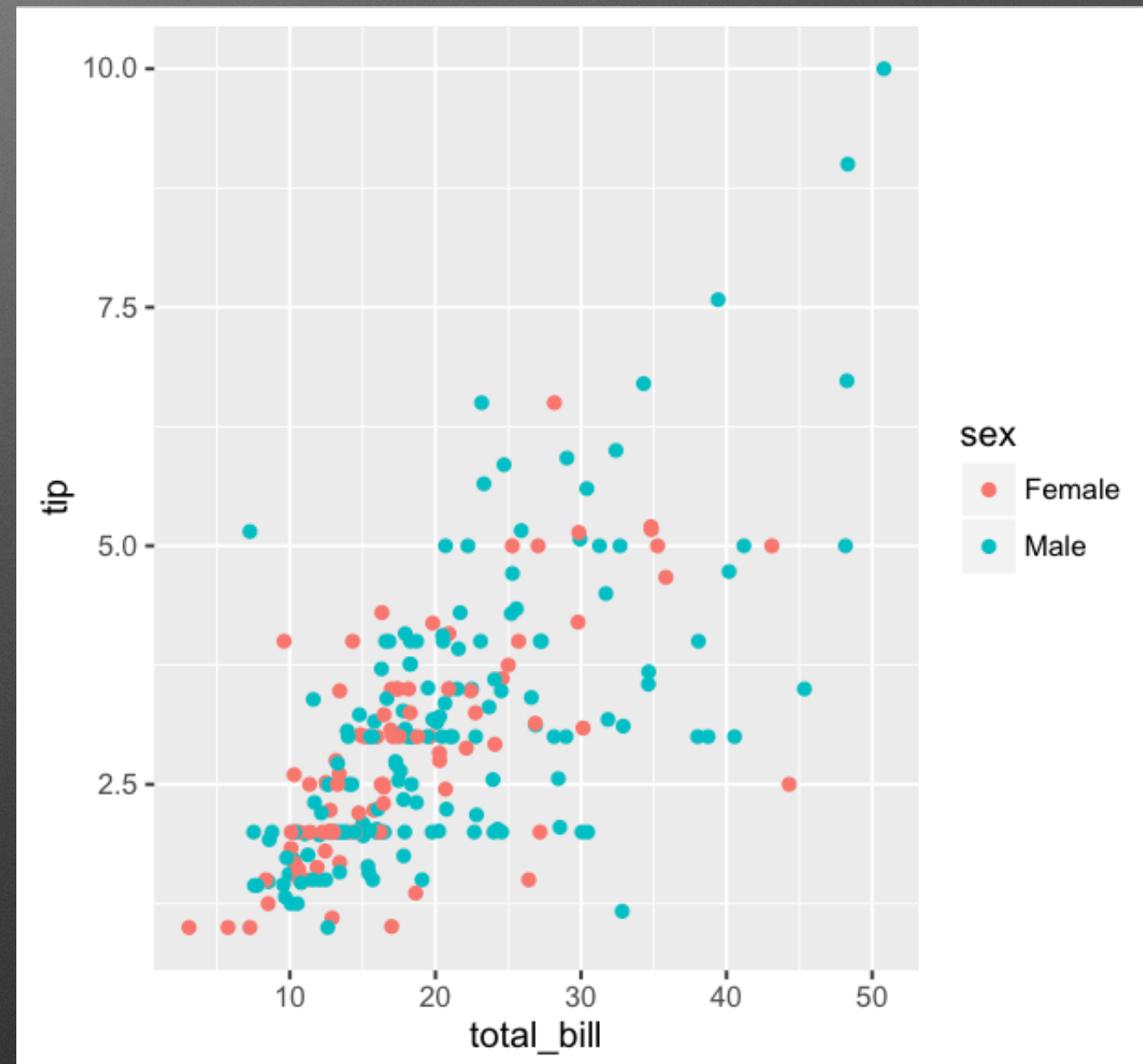
GGally::ggmatrix

- Retrieve individual plot

```
ggplot2_obj <- pm[3,1]
```

- Store individual plot

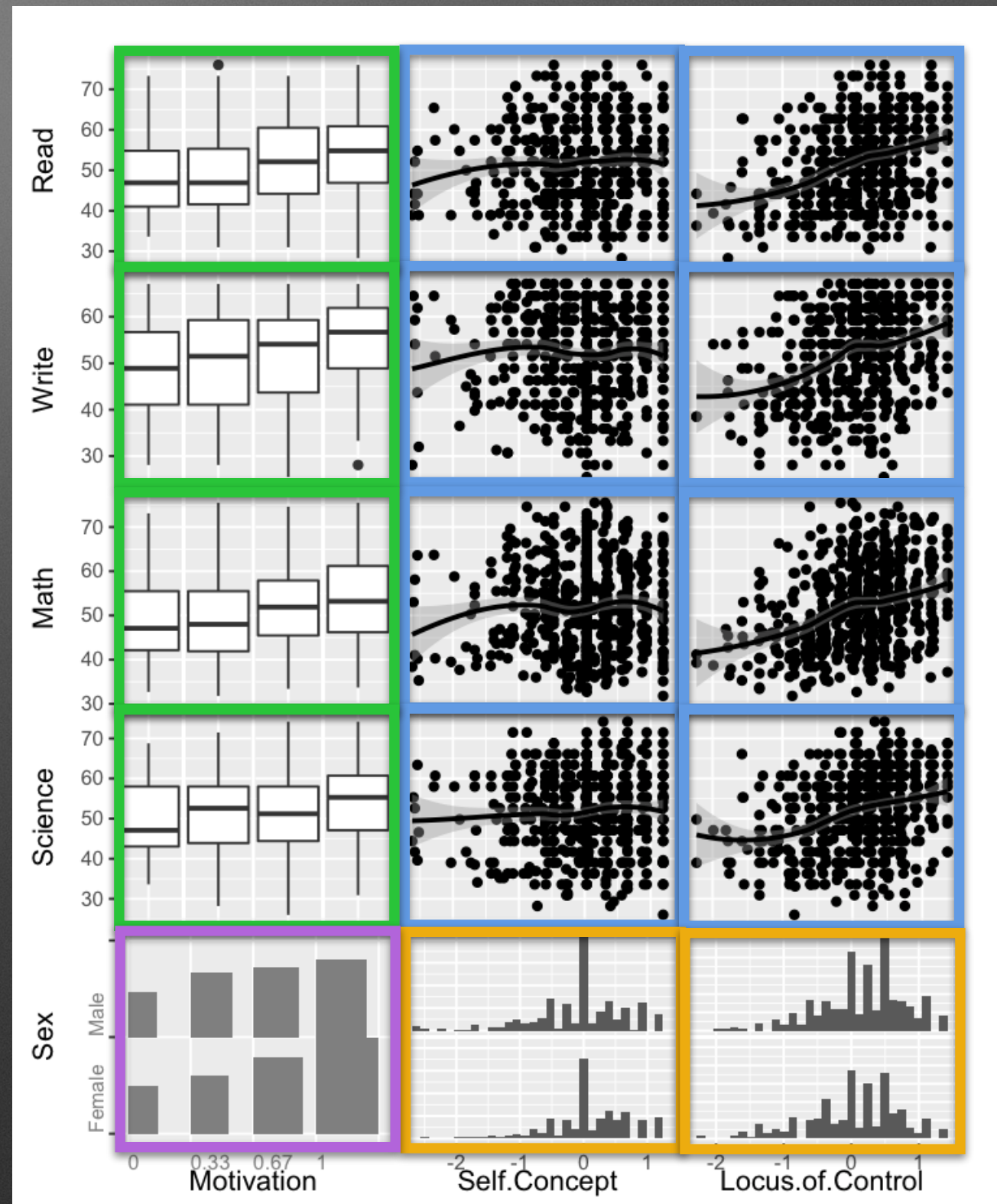
```
pm[row_pos, col_pos] <-  
  other_ggplot2_obj
```



pm[3,1]

GGally::ggduo

- Pairwise plot matrix for two grouped data
 - A, B, C vs. D, E, F, G
- Four main types:
 - continuous
 - comboVertical
 - comboHorizontal
 - discrete



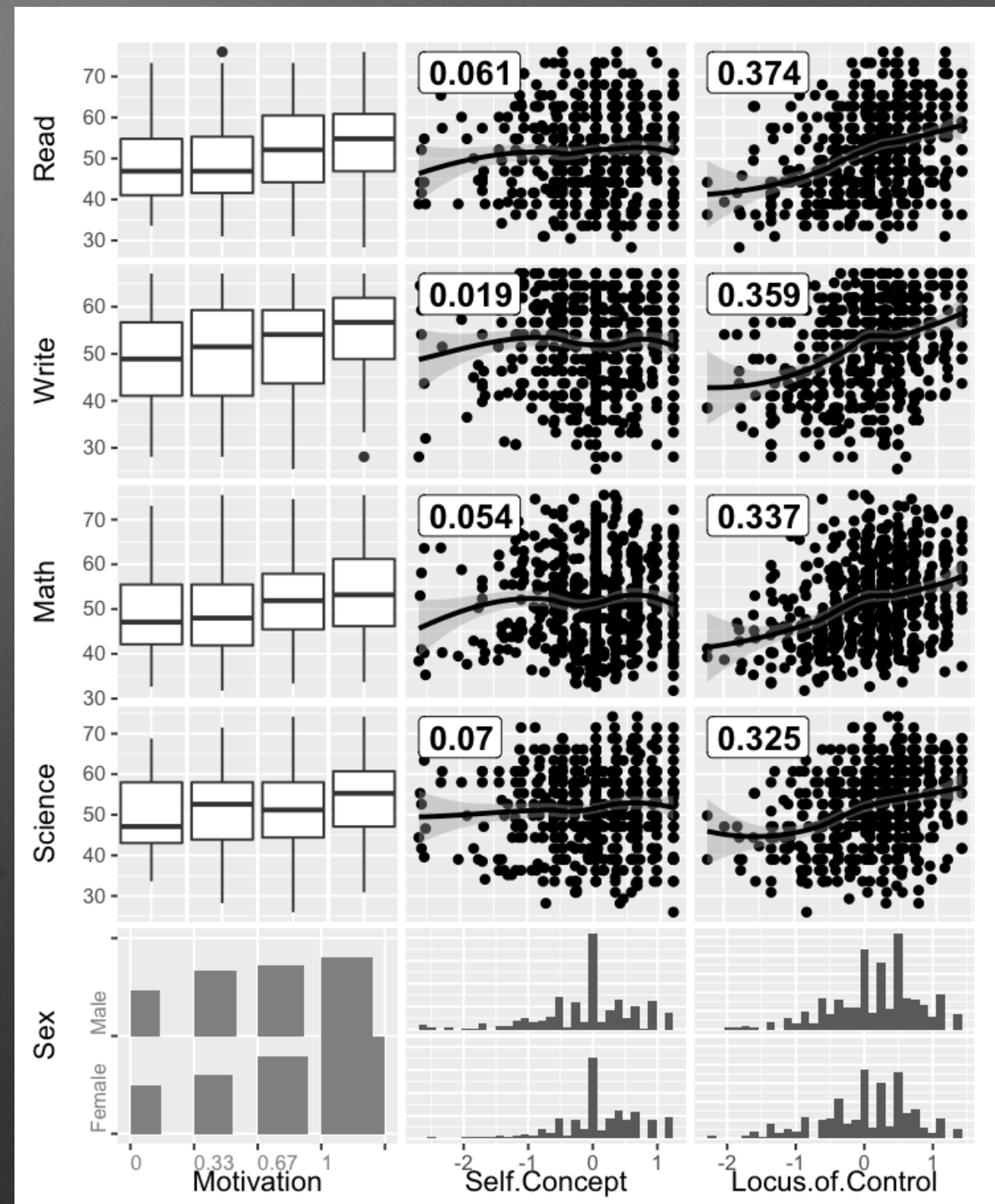
```
ggduo(psych, 1:3, 4:8, showStrips = FALSE)
```


Application

- Can directly be used in
 - Canonical correlation analysis
 - Multiple time series analysis
 - Regression analysis

Canonical correlation analysis (CCA)

- `Ggally::ggpairs` can be used for “within” correlation
- `Ggally::ggduo` is useful for “between” correlations
- Can supply custom functions
 - Just like in `Ggally::ggpairs`
- ```
ggduo(
 dt, 1:3, 4:8,
 types = list(
 continuous = loess_with_cor
),
 showStrips = FALSE
)
```



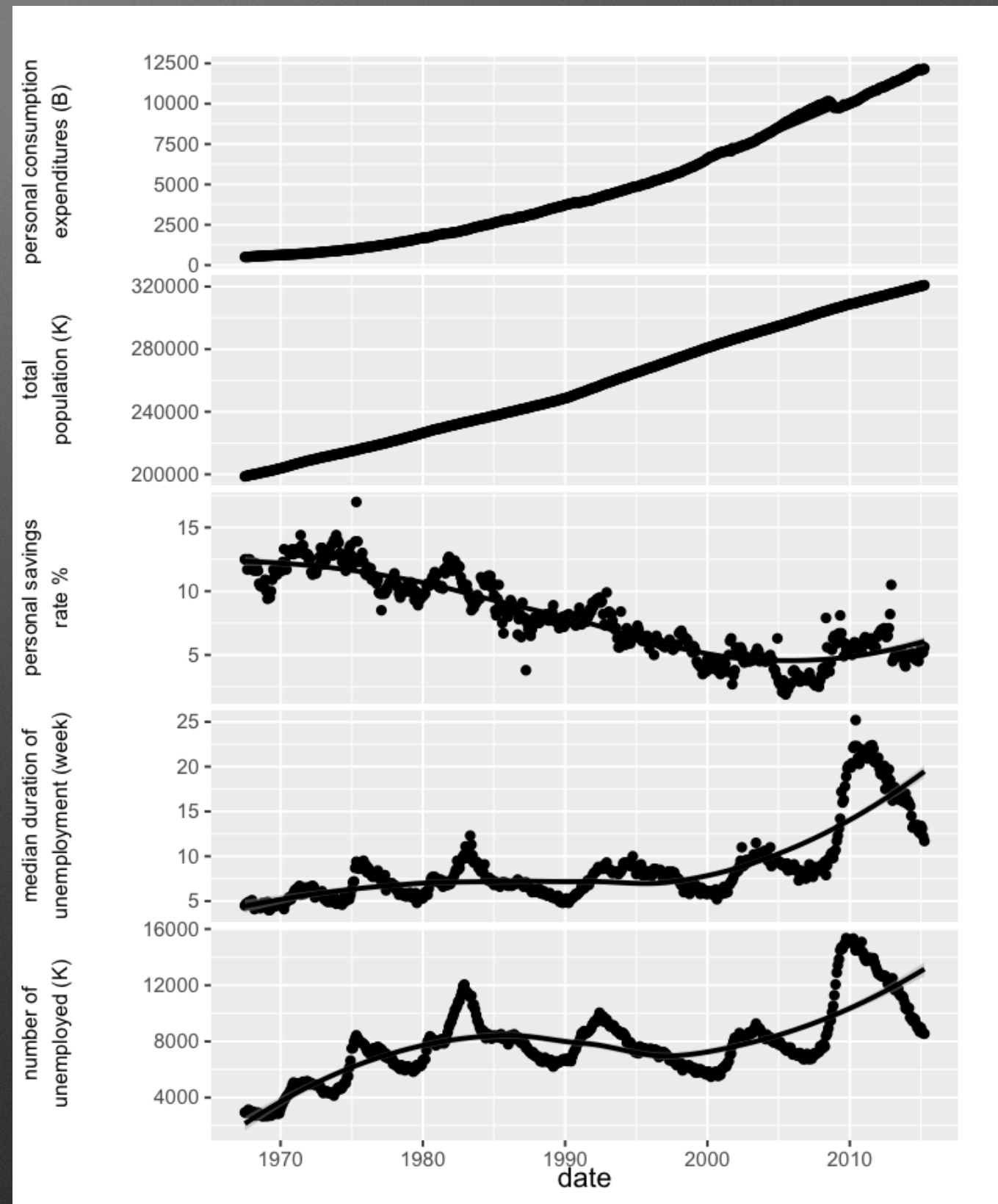
```
ggduo(psych, 1:3, 4:8, showStrips = FALSE)
```



# Multiple time series

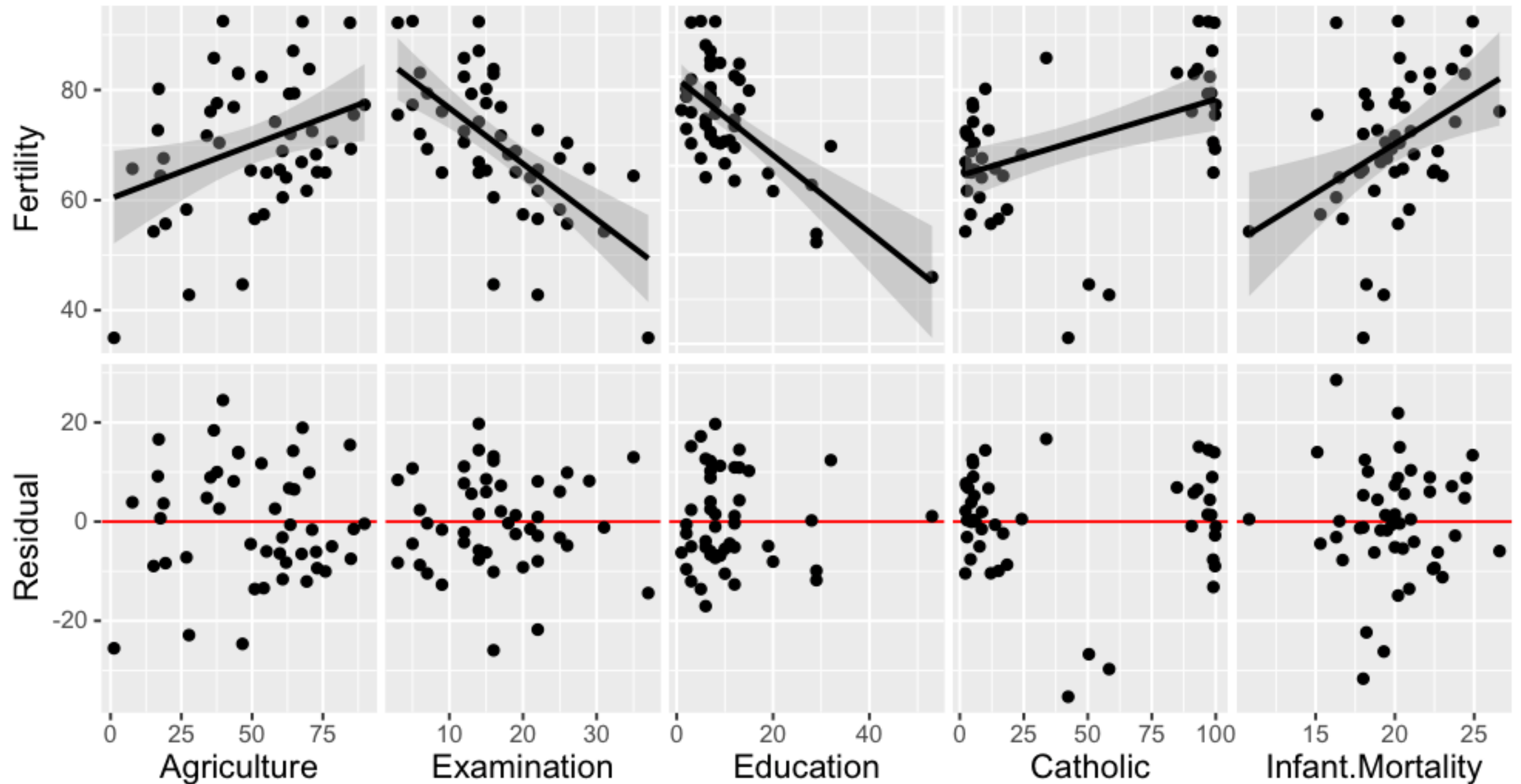
- Multiple Y variables over time

```
ggduo(
 economics, 1, 2:6,
 columnLabelsY = y_labels
) +
 theme(
 axis.title.y =
 element_text(size = 9)
)
```





# Regression analysis





# Regression analysis

Known information:

```
swiss$Residual <- seq_len(nrow(swiss))
```

```
residuals <- lapply(data[2:6], function(x) {
 summary(lm(Fertility ~ x, data = data))$residuals
})
```

```
y_range <- range(unlist(residuals))
```



# Regression analysis - manually

```
pm <- ggduo(
 swiss, 2:6, c("Fertility", "Residual"),
 types = list(continuous = ggally_smooth_lm)
)
for (j in 1:5) {
 resid_data = data.frame(
 x = swiss[[j + 1]],
 y = residuals[[j]]
)
 # store plot
 pm[2,j] <- ggplot(data = resid_data, mapping = aes(x, y)) +
 ylim(y_range) +
 geom_hline(yintercept = 0, color = "red") +
 geom_point()
}
pm
```



# Regression analysis - custom function

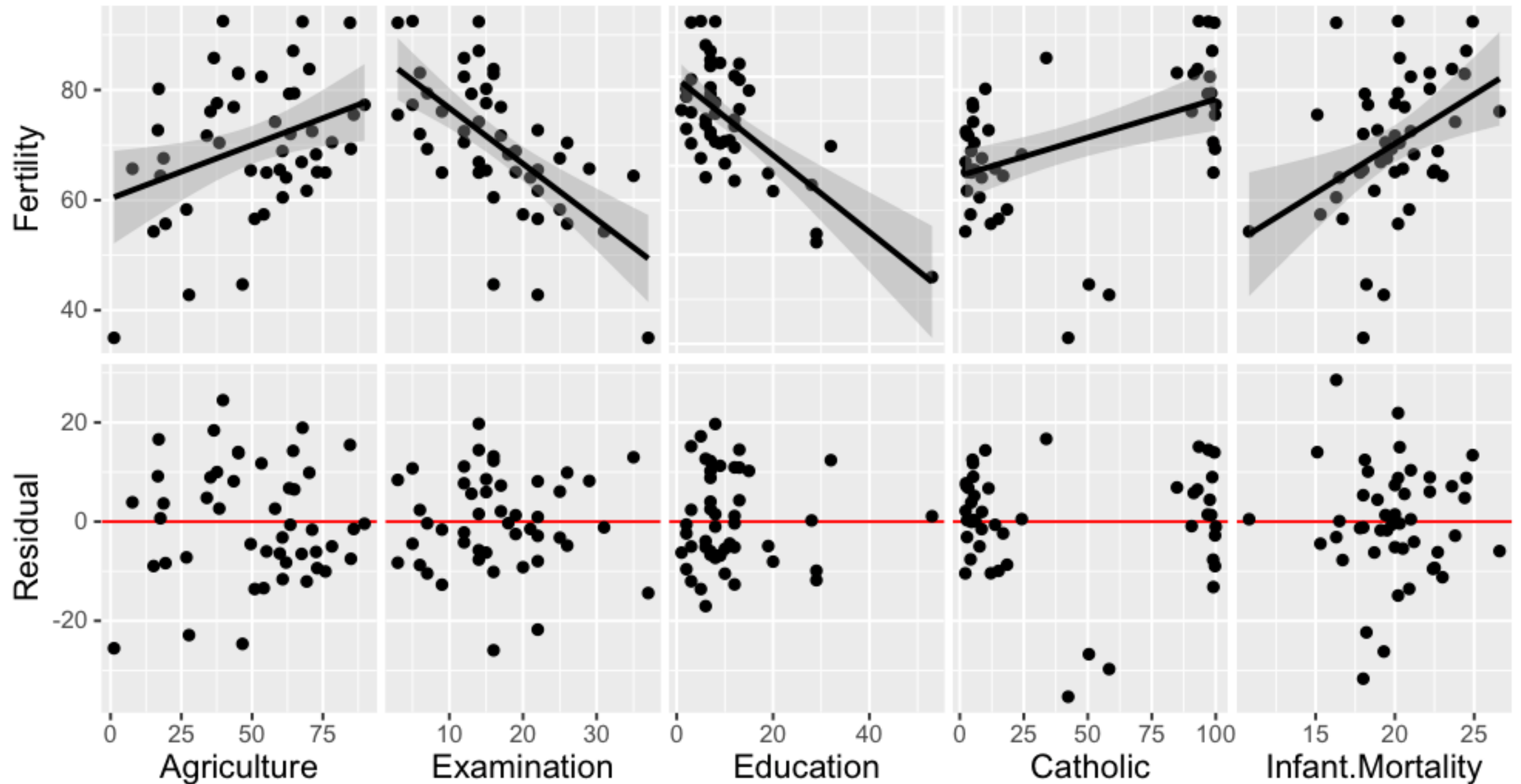
```
lm_or_res <- function(data, mapping, ..., lc = "red", ls = 1) {
 if (as.character(mapping$y) != "Residual") {
 return(ggally_smooth_lm(data, mapping, ...))
 }
}
```

```
resid_data <- data.frame(
 x = data[[as.character(mapping$x)]],
 y = residuals[[as.character(mapping$x)]]
)
ggplot(data = resid_data, mapping = aes(x, y)) +
 ylim(y_range) +
 geom_hline(yintercept = 0, color = lc, size = ls) +
 geom_point(...)
}
```

```
ggduo(swiss, 2:6, c(1,7), types = list(continuous = lm_or_res))
```



# Regression analysis





# GGally::ggduo

- GGally::ggduo
  - Pairs plot matrix for two grouped data
  - Direct application
    - Canonical correlation analysis
    - Multiple time series analysis
    - Regression analysis
  - Custom functions!
- Future
  - Look into functions that take model objects directly ... broom!





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# Data

```
tips <- reshape::tips
economics <- ggplot2::economics
swiss <- datasets::swiss

http://www.ats.ucla.edu/stat/r/dae/canonical.htm (June 23, 2016)
psych <- read.csv("http://www.ats.ucla.edu/stat/data/mmreg.csv")
colnames(psych) <- c("Control", "Concept", "Motivation", "Read",
"Write", "Math", "Science", "Sex")
psych <- data.frame(
 Motivation = psych$Motivation,
 Self.Concept = psych$Concept,
 Locus.of.Control = psych$Control,
 Read = psych$Read,
 Write = psych$Write,
 Math = psych$Math,
 Science = psych$Science,
 Sex = c("0" = "Male", "1" = "Female")[as.character(psych$Sex)]
)
```