

CS&SS 569 Visualizing Data and Models

Lab 5: Intro to `tile`

Ramses Llobet

Department of Political Science, UW

February 2, 2026

Introduction

- ▶ Overview of tile

Introduction

- ▶ Overview of `tile`
- ▶ Preview of three examples

Introduction

- ▶ Overview of `tile`
- ▶ Preview of three examples
 - ▶ Scatterplot: HW1 example

Introduction

- ▶ Overview of tile
- ▶ Preview of three examples
 - ▶ Scatterplot: HW1 example
 - ▶ Expected probabilities and first differences: Voting example

Introduction

- ▶ Overview of tile
- ▶ Preview of three examples
 - ▶ Scatterplot: HW1 example
 - ▶ Expected probabilities and first differences: Voting example
 - ▶ Ropeladder: Crime example

Introduction

- ▶ Overview of `tile`
- ▶ Preview of three examples
 - ▶ Scatterplot: HW1 example
 - ▶ Expected probabilities and first differences: Voting example
 - ▶ Ropeladder: Crime example
- ▶ Installing `tile` and `simcf`

Introduction

- ▶ Overview of `tile`
- ▶ Preview of three examples
 - ▶ Scatterplot: HW1 example
 - ▶ Expected probabilities and first differences: Voting example
 - ▶ Ropeladder: Crime example
- ▶ Installing `tile` and `simcf`
- ▶ Walking through examples

Overview of tile

- ▶ A fully featured R graphics package built on the grid graphics environment

Overview of tile

- ▶ A fully featured R graphics package built on the grid graphics environment
- ▶ Features:

Overview of tile

- ▶ A fully featured R graphics package built on the grid graphics environment
- ▶ Features:
 - ▶ Make standard displays like scatterplots, lineplots, and dotplots
 - ▶ Create more experimental formats like ropeladders
 - ▶ Summarize uncertainty in inferences from model

Overview of tile

- ▶ A fully featured R graphics package built on the grid graphics environment
- ▶ Features:
 - ▶ Make standard displays like scatterplots, lineplots, and dotplots
 - ▶ Create more experimental formats like ropeladders
 - ▶ Summarize uncertainty in inferences from model
 - ▶ Avoid extrapolation from the original data underlying your model
 - ▶ Fully control titles, annotation, and layering of graphical elements
 - ▶ Build your own tiled graphics from primitives

Overview of tile

- ▶ A fully featured R graphics package built on the grid graphics environment
- ▶ Features:
 - ▶ Make standard displays like scatterplots, lineplots, and dotplots
 - ▶ Create more experimental formats like ropeladders
 - ▶ Summarize uncertainty in inferences from model
 - ▶ Avoid extrapolation from the original data underlying your model
 - ▶ Fully control titles, annotation, and layering of graphical elements
 - ▶ Build your own tiled graphics from primitives
- ▶ Work well in combination with `simcf` package
 - ▶ Calculate counterfactual expected values, first differences, and relative risks, and their confidence intervals

Overview of `tile`

- ▶ A fully featured R graphics package built on the `grid` graphics environment
- ▶ Features:
 - ▶ Make standard displays like scatterplots, lineplots, and dotplots
 - ▶ Create more experimental formats like ropeladders
 - ▶ Summarize uncertainty in inferences from model
 - ▶ Avoid extrapolation from the original data underlying your model
 - ▶ Fully control titles, annotation, and layering of graphical elements
 - ▶ Build your own tiled graphics from primitives
- ▶ Work well in combination with `simcf` package
 - ▶ Calculate counterfactual expected values, first differences, and relative risks, and their confidence intervals
 - ▶ More later

Overview of tile

- ▶ Three steps to make tile plots (from Chris's “[Tufte Without Tears](#)”)

Overview of tile

- ▶ Three steps to make tile plots (from Chris's "Tufte Without Tears")
 1. **Create data traces:** Each trace contains the data and graphical parameters needed to plot a single set of graphical elements to one or more plots

Overview of tile

- ▶ Three steps to make tile plots (from Chris's "Tufte Without Tears")
 1. **Create data traces:** Each trace contains the data and graphical parameters needed to plot a single set of graphical elements to one or more plots
 - ▶ Could be a set of points, or text labels, or lines, or a polygon
 - ▶ Could be a set of points and symbols, colors, labels, fit line, CIs, and/or extrapolation limits
 - ▶ Could be the data for a dotchart, with labels for each line
 - ▶ Could be the marginal data for a rug
 - ▶ All annotation must happen in this step
 - ▶ Basic traces: `linesTile()`, `pointstitle()`, `polygonTile()`, `polylinesTile()`, and `textTile()`
 - ▶ Complex traces: `lineplot()`, `scatter()`, `ropeladder()`, and `rugTile()`

Overview of tile

- ▶ Primitive trace functions:

Overview of `tile`

- ▶ Primitive trace functions:
 - ▶ `linesTile()`: Plot a set of connected line segments

Overview of tile

- ▶ Primitive trace functions:
 - ▶ `linesTile()`: Plot a set of connected line segments
 - ▶ `pointsTile()`: Plot a set of points

Overview of tile

- ▶ Primitive trace functions:
 - ▶ `linesTile()`: Plot a set of connected line segments
 - ▶ `pointsTile()`: Plot a set of points
 - ▶ `polygonTile()`: Plot a shaded region

Overview of tile

- ▶ Primitive trace functions:
 - ▶ `linesTile()`: Plot a set of connected line segments
 - ▶ `pointsTile()`: Plot a set of points
 - ▶ `polygonTile()`: Plot a shaded region
 - ▶ `polylinesTile()`: Plot a set of unconnected line segments

Overview of tile

- ▶ Primitive trace functions:
 - ▶ `linesTile()`: Plot a set of connected line segments
 - ▶ `pointsTile()`: Plot a set of points
 - ▶ `polygonTile()`: Plot a shaded region
 - ▶ `polylinesTile()`: Plot a set of unconnected line segments
 - ▶ `textTile()`: Plot text labels

Overview of tile

- ▶ Primitive trace functions:
 - ▶ `linesTile()`: Plot a set of connected line segments
 - ▶ `pointsTile()`: Plot a set of points
 - ▶ `polygonTile()`: Plot a shaded region
 - ▶ `polylinesTile()`: Plot a set of unconnected line segments
 - ▶ `textTile()`: Plot text labels
- ▶ Complex traces for model or data exploration:

Overview of tile

- ▶ Primitive trace functions:
 - ▶ `linesTile()`: Plot a set of connected line segments
 - ▶ `pointsTile()`: Plot a set of points
 - ▶ `polygonTile()`: Plot a shaded region
 - ▶ `polylinesTile()`: Plot a set of unconnected line segments
 - ▶ `textTile()`: Plot text labels
- ▶ Complex traces for model or data exploration:
 - ▶ `lineplot()`: Plot lines with confidence intervals, extrapolation warnings

Overview of tile

- ▶ Primitive trace functions:
 - ▶ `linesTile()`: Plot a set of connected line segments
 - ▶ `pointsTile()`: Plot a set of points
 - ▶ `polygonTile()`: Plot a shaded region
 - ▶ `polylinesTile()`: Plot a set of unconnected line segments
 - ▶ `textTile()`: Plot text labels
- ▶ Complex traces for model or data exploration:
 - ▶ `lineplot()`: Plot lines with confidence intervals, extrapolation warnings
 - ▶ `ropeladder()`: Plot dotplots with confidence intervals, extrapolation warnings, and shaded ranges

Overview of tile

- ▶ Primitive trace functions:
 - ▶ `linesTile()`: Plot a set of connected line segments
 - ▶ `pointsTile()`: Plot a set of points
 - ▶ `polygonTile()`: Plot a shaded region
 - ▶ `polylinesTile()`: Plot a set of unconnected line segments
 - ▶ `textTile()`: Plot text labels
- ▶ Complex traces for model or data exploration:
 - ▶ `lineplot()`: Plot lines with confidence intervals, extrapolation warnings
 - ▶ `ropeladder()`: Plot dotplots with confidence intervals, extrapolation warnings, and shaded ranges
 - ▶ `rugTile()`: Plot marginal data rugs to axes of plots

Overview of tile

- ▶ Primitive trace functions:
 - ▶ `linesTile()`: Plot a set of connected line segments
 - ▶ `pointsTile()`: Plot a set of points
 - ▶ `polygonTile()`: Plot a shaded region
 - ▶ `polylinesTile()`: Plot a set of unconnected line segments
 - ▶ `textTile()`: Plot text labels
- ▶ Complex traces for model or data exploration:
 - ▶ `lineplot()`: Plot lines with confidence intervals, extrapolation warnings
 - ▶ `ropeladder()`: Plot dotplots with confidence intervals, extrapolation warnings, and shaded ranges
 - ▶ `rugTile()`: Plot marginal data rugs to axes of plots
 - ▶ `scatter()`: Plot scatterplots with text and symbol markers, fit lines, and confidence intervals

Overview of tile

Overview of tile

- ▶ Three steps to make tile plots (from Chris's "Tufte Without Tears")
 1. **Create data trace:** Each trace contains the data and graphical parameters needed to plot a single set of graphical elements to one or more plots

Overview of `tile`

- ▶ Three steps to make `tile` plots (from Chris's "Tufte Without Tears")
 1. **Create data trace:** Each trace contains the data and graphical parameters needed to plot a single set of graphical elements to one or more plots
 2. **Plot the data traces:** Using the `tile()` function, simultaneously plot all traces to all plots

Overview of tile

- ▶ Three steps to make tile plots (from Chris's "Tufte Without Tears")
 1. **Create data trace:** Each trace contains the data and graphical parameters needed to plot a single set of graphical elements to one or more plots
 2. **Plot the data traces:** Using the `tile()` function, simultaneously plot all traces to all plots
 - ▶ This is the step where the scaffolding gets made: axes and titles
 - ▶ Set up the rows and columns of plots
 - ▶ Titles of plots, axes, rows of plots, columns of plots, etc.
 - ▶ Set up axis limits, ticks, tick labels, logging of axes

Overview of tile

Overview of tile

- ▶ Three steps to make tile plots (from Chris's "Tufte Without Tears")
 1. **Create data trace:** Each trace contains the data and graphical parameters needed to plot a single set of graphical elements to one or more plots
 2. **Plot the data traces:** Using the `tile()` function, simultaneously plot all traces to all plots
 - ▶ This is the step where the scaffolding gets made: axes and titles
 - ▶ Set up the rows and columns of plots
 - ▶ Titles of plots, axes, rows of plots, columns of plots, etc.
 - ▶ Set up axis limits, ticks, tick labels, logging of axes
 3. **Examine output and revise:** Look at the graph made in step 2, and tweak the input parameters for steps 1 and 2 to make a better graph

Three examples

- ▶ Scatterplot: HW1 example

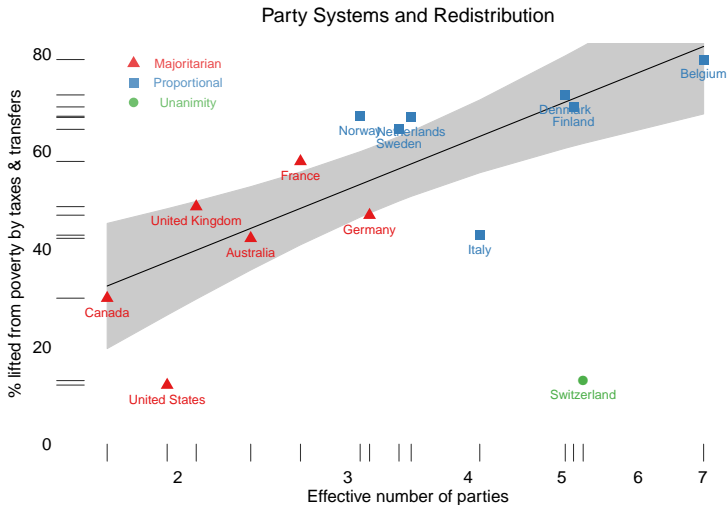
Three examples

- ▶ Scatterplot: HW1 example
- ▶ Expected probabilities and first differences: Voting example

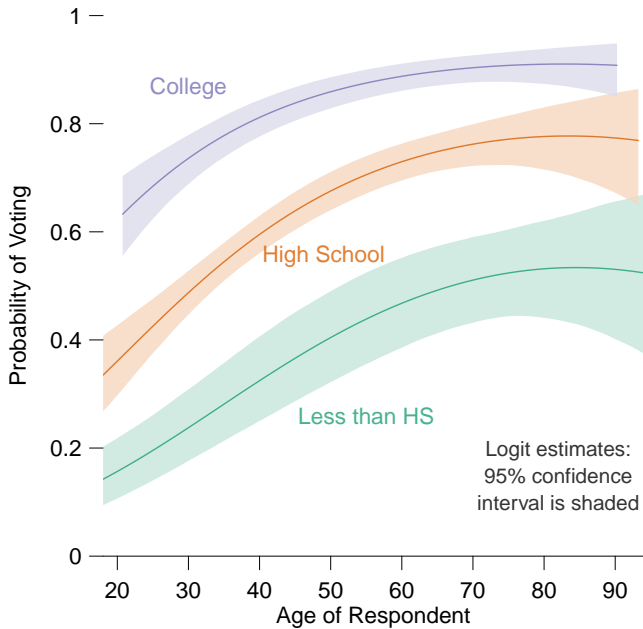
Three examples

- ▶ Scatterplot: HW1 example
- ▶ Expected probabilities and first differences: Voting example
- ▶ Ropeladder: Crime examples (if time permits)

Scatterplot: HW 1 example



Expected probabilities and first differences: Voting example



Scatterplot: HW 1 example

- ▶ A quick detour to model results presentation and the logic of simulation (consult POLS/CSSS 510:MLE::Topic 3)

Scatterplot: HW 1 example

- ▶ A quick detour to model results presentation and the logic of simulation (consult POLS/CSSS 510:MLE::Topic 3)
 1. Obtain estimated parameters ($\hat{\beta}_k$) and standard errors (more precisely, the variance-covariance matrix)

Scatterplot: HW 1 example

- ▶ A quick detour to model results presentation and the logic of simulation (consult POLS/CSSS 510:MLE::Topic 3)
 1. Obtain estimated parameters ($\hat{\beta}_k$) and standard errors (more precisely, the variance-covariance matrix)
 - ▶ `lm()`, `glm()`...; `coef()`, `vcov()`...
 - ▶ What you see in usual regression tables

Scatterplot: HW 1 example

- ▶ A quick detour to model results presentation and the logic of simulation (consult POLS/CSSS 510:MLE::Topic 3)
 1. Obtain estimated parameters ($\hat{\beta}_k$) and standard errors (more precisely, the variance-covariance matrix)
 - ▶ `lm()`, `glm()`...; `coef()`, `vcov()`...
 - ▶ What you see in usual regression tables
 2. Capture our uncertainty around $\hat{\beta}_k$ by drawing, say, 10,000 $\tilde{\beta}_k$ from a multivariate normal distribution

Scatterplot: HW 1 example

- ▶ A quick detour to model results presentation and the logic of simulation (consult POLS/CSSS 510:MLE::Topic 3)
 1. Obtain estimated parameters ($\hat{\beta}_k$) and standard errors (more precisely, the variance-covariance matrix)
 - ▶ `lm()`, `glm()`...; `coef()`, `vcov()`...
 - ▶ What you see in usual regression tables
 2. Capture our uncertainty around $\hat{\beta}_k$ by drawing, say, 10,000 $\tilde{\beta}_k$ from a multivariate normal distribution
 - ▶ `MASS::mvrnorm()`

Scatterplot: HW 1 example

- ▶ A quick detour to model results presentation and the logic of simulation (consult POLS/CSSS 510:MLE::Topic 3)
 1. Obtain estimated parameters ($\hat{\beta}_k$) and standard errors (more precisely, the variance-covariance matrix)
 - ▶ `lm()`, `glm()`...; `coef()`, `vcov()`...
 - ▶ What you see in usual regression tables
 2. Capture our uncertainty around $\hat{\beta}_k$ by drawing, say, 10,000 $\tilde{\beta}_k$ from a multivariate normal distribution
 - ▶ `MASS::mvrnorm()`
 3. Specify counterfactual scenarios (hypothetical values for all relevant covariates x_k)

Scatterplot: HW 1 example

- ▶ A quick detour to model results presentation and the logic of simulation (consult POLS/CSSS 510:MLE::Topic 3)
 1. Obtain estimated parameters ($\hat{\beta}_k$) and standard errors (more precisely, the variance-covariance matrix)
 - ▶ `lm()`, `glm()`...; `coef()`, `vcov()`...
 - ▶ What you see in usual regression tables
 2. Capture our uncertainty around $\hat{\beta}_k$ by drawing, say, 10,000 $\tilde{\beta}_k$ from a multivariate normal distribution
 - ▶ `MASS::mvrnorm()`
 3. Specify counterfactual scenarios (hypothetical values for all relevant covariates x_k)
 - ▶ `simcf::cfMake`, `cfChange`...

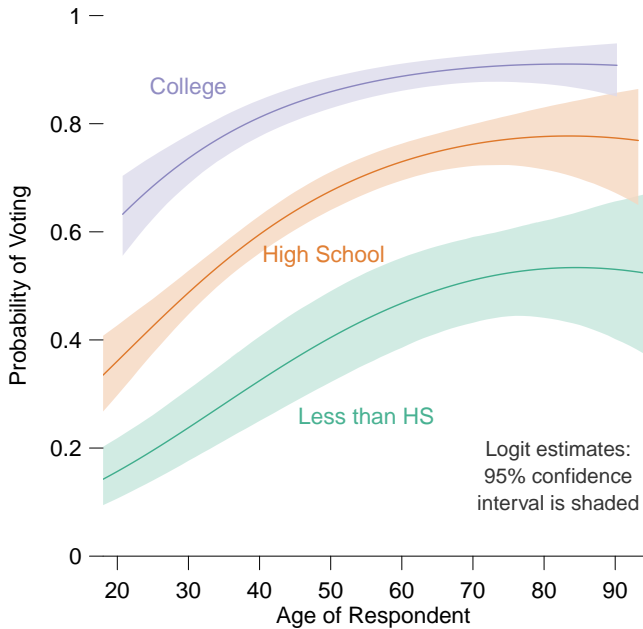
Scatterplot: HW 1 example

- ▶ A quick detour to model results presentation and the logic of simulation (consult POLS/CSSS 510:MLE::Topic 3)
 1. Obtain estimated parameters ($\hat{\beta}_k$) and standard errors (more precisely, the variance-covariance matrix)
 - ▶ `lm()`, `glm()`...; `coef()`, `vcov()`...
 - ▶ What you see in usual regression tables
 2. Capture our uncertainty around $\hat{\beta}_k$ by drawing, say, 10,000 $\tilde{\beta}_k$ from a multivariate normal distribution
 - ▶ `MASS::mvrnorm()`
 3. Specify counterfactual scenarios (hypothetical values for all relevant covariates x_k)
 - ▶ `simcf::cfMake`, `cfChange`...
 4. Simulate quantities of interest by compounding those 10,000 $\tilde{\beta}_k$ with counterfactual scenarios

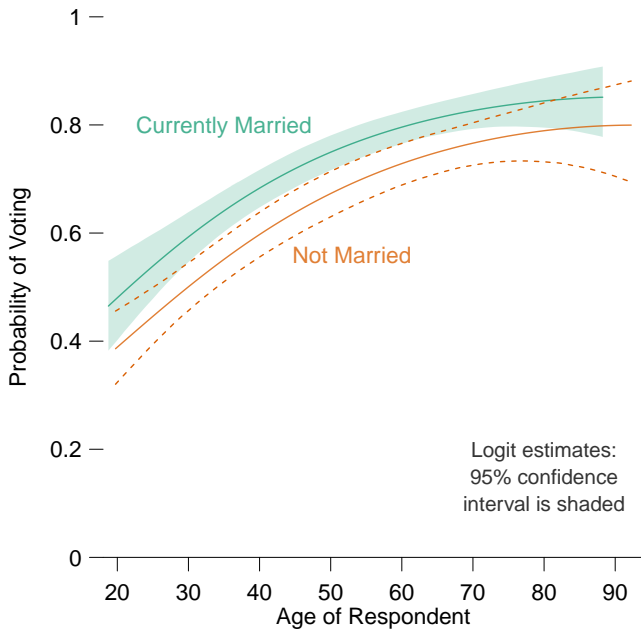
Scatterplot: HW 1 example

- ▶ A quick detour to model results presentation and the logic of simulation (consult POLS/CSSS 510:MLE::Topic 3)
 1. Obtain estimated parameters ($\hat{\beta}_k$) and standard errors (more precisely, the variance-covariance matrix)
 - ▶ `lm()`, `glm()`...; `coef()`, `vcov()`...
 - ▶ What you see in usual regression tables
 2. Capture our uncertainty around $\hat{\beta}_k$ by drawing, say, 10,000 $\tilde{\beta}_k$ from a multivariate normal distribution
 - ▶ `MASS::mvrnorm()`
 3. Specify counterfactual scenarios (hypothetical values for all relevant covariates x_k)
 - ▶ `simcf::cfMake`, `cfChange`...
 4. Simulate quantities of interest by compounding those 10,000 $\tilde{\beta}_k$ with counterfactual scenarios
 - ▶ Then compute average (point estimate) and appropriate percentiles (confidence intervals)

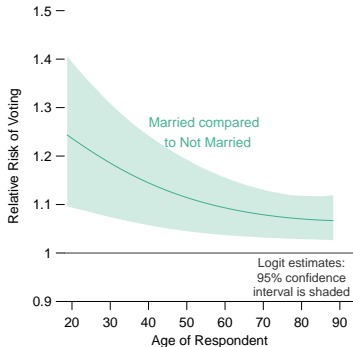
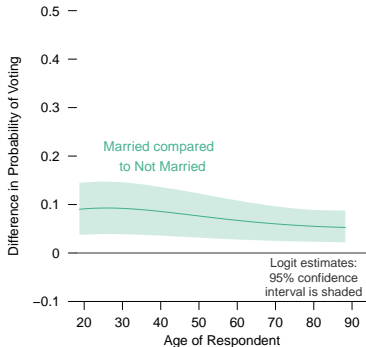
Expected probabilities and first differences: Voting example



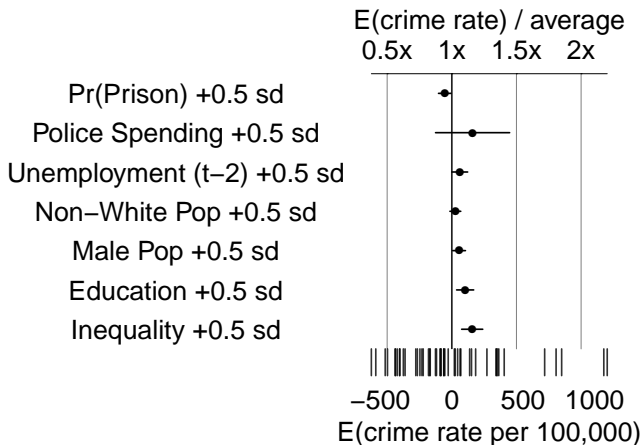
Expected probabilities and first differences: Voting example



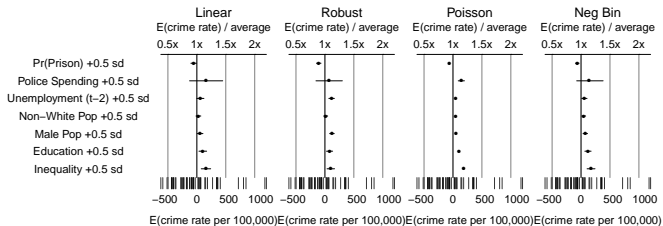
Expected probabilities and first differences: Voting example



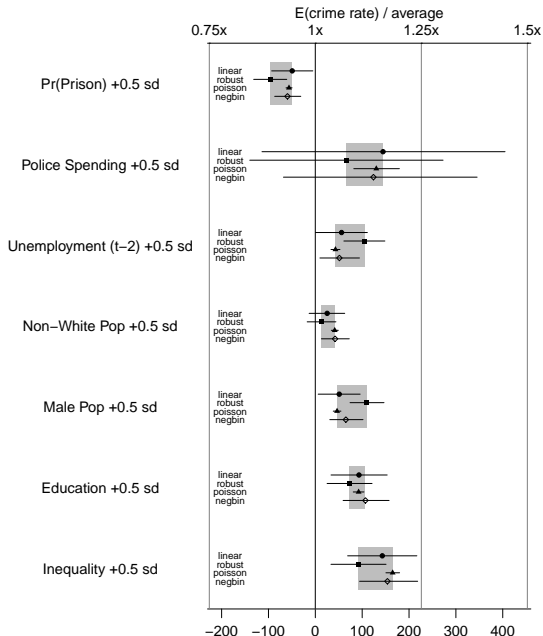
Ropeladder: Crime example (if time permits)



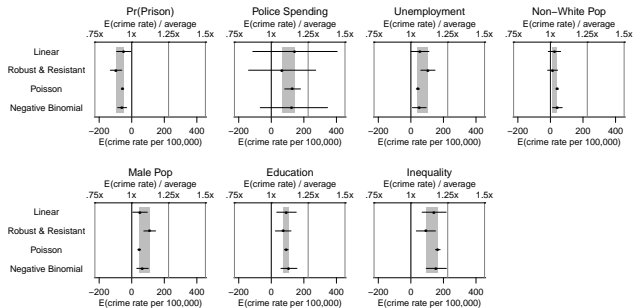
Ropeladder: Crime example (if time permits)



Ropeladder: Crime example (if time permits)



Ropeladder: Crime example (if time permits)



Installing tile and simcf

- ▶ Go to Chris's website, [Software section](#)
- ▶ Also download all R scripts and data under today's Lab section