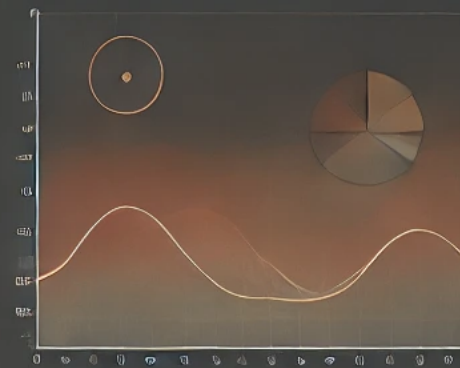
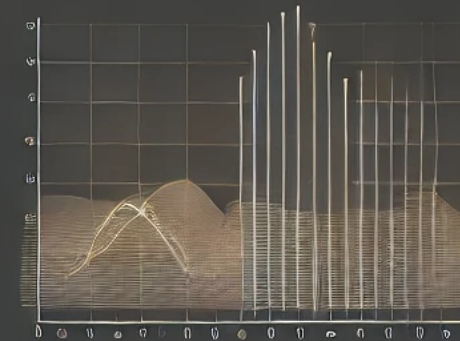
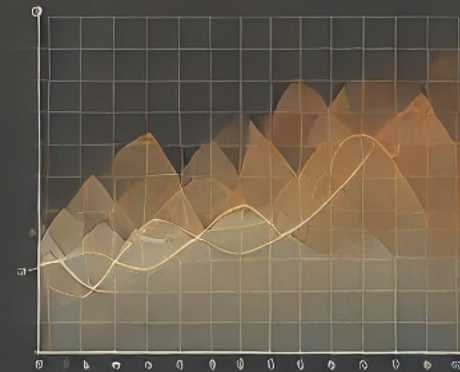
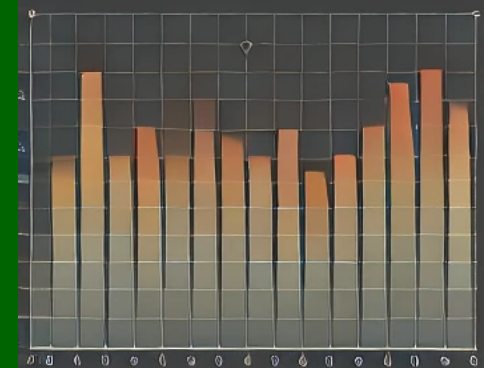
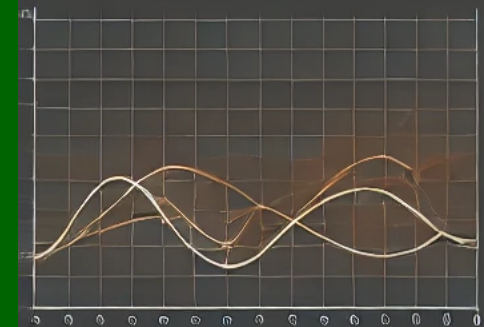
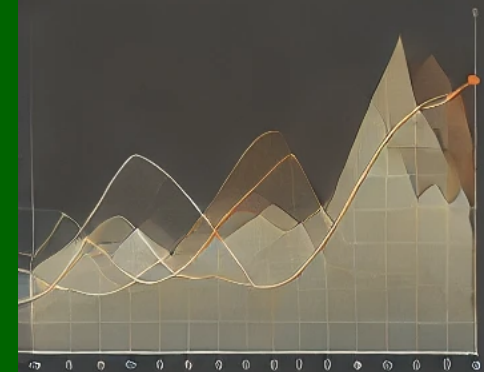


# Das Experiment



# Warum sollten wir *randomisieren*?

Das Fundamentale Problem der *kausalen* Inferenz:

- + Auf individueller Ebene können keine kausalen Effekte beobachtet werden
- + Es gibt keine individuellen Alternativszenarien (außer in "Zurück in die Zukunft")

Dies bedeutet wir müssen uns durchschnittliche Effekte auf Gruppenebene anschauen!

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Dies bedeutet wir müssen uns durchschnittliche Effekte auf Gruppenebene anschauen!

Wenn wir durchschnittliche Effekte zwischen Gruppen von Personen betrachten wollen, dann funktioniert dies nur, wenn die Gruppen die gleichen Eigenschaften haben.

# Warum sollten wir *randomisieren*?

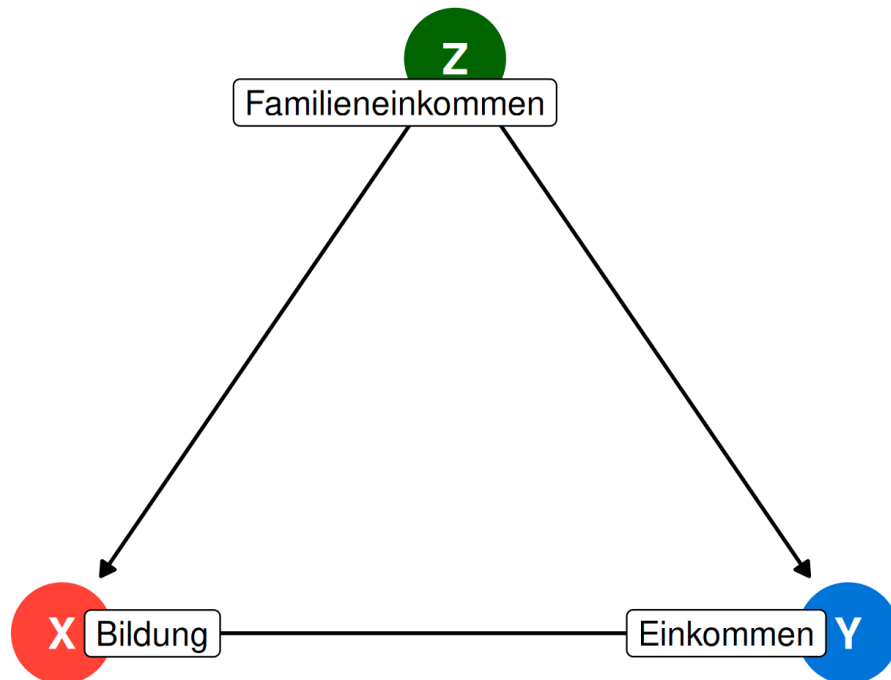
Mit einer ausreichend großen Stichprobe erhalten Sie durch Randomisierung Gruppen, die in ihren (pre-Treatment) Charakteristika gleich sind.

Übertragen auf ihr DAG bedeutet die Randomisierung: **Confounder beeinflussen ihr Treatment nicht!**

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Mit einer ausreichend großen Stichprobe erhalten Sie durch Randomisierung Gruppen, die in ihren (pre-Treatment) Charakteristika gleich sind.

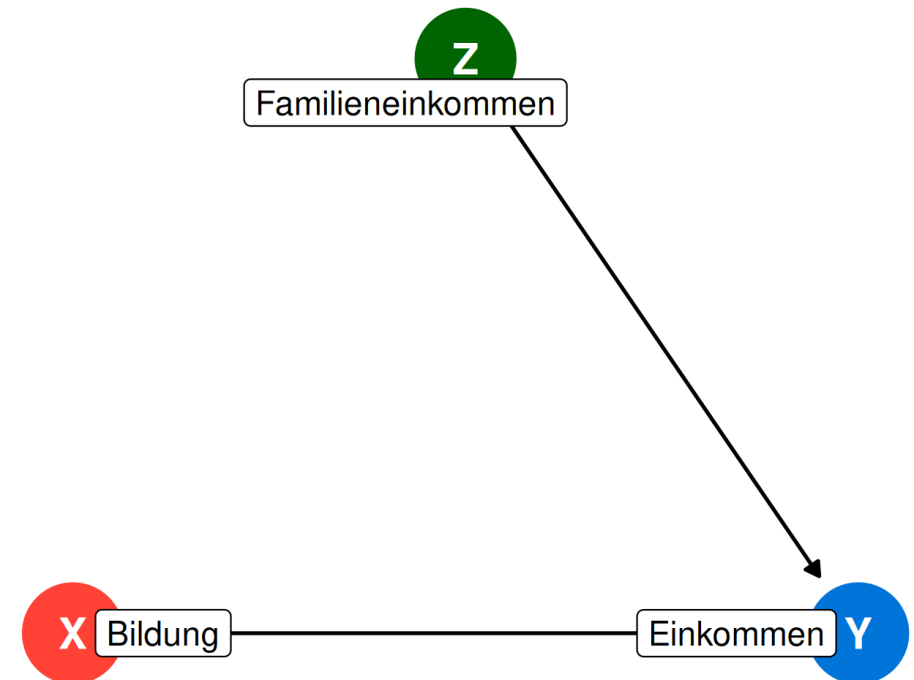
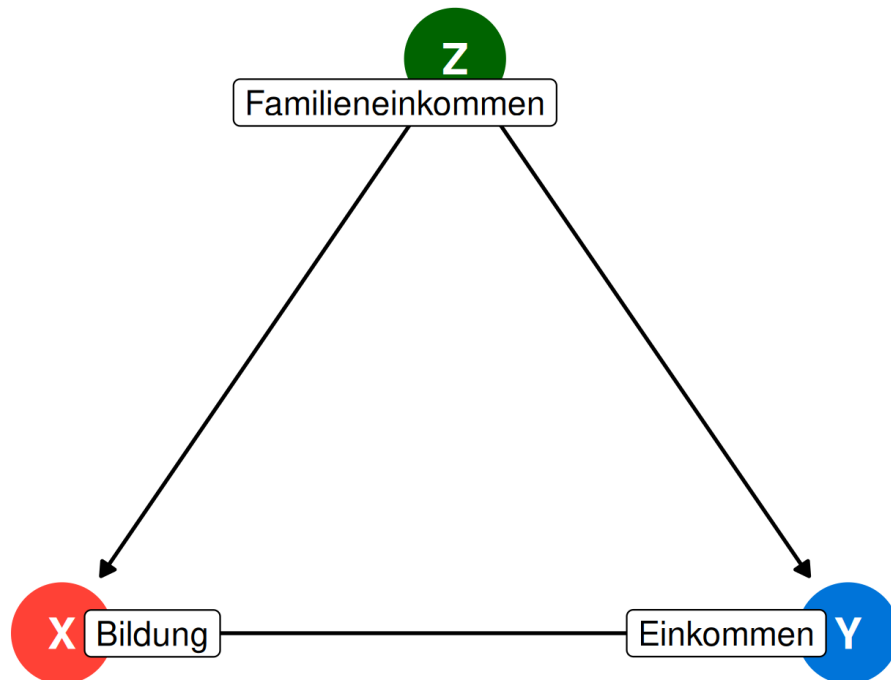
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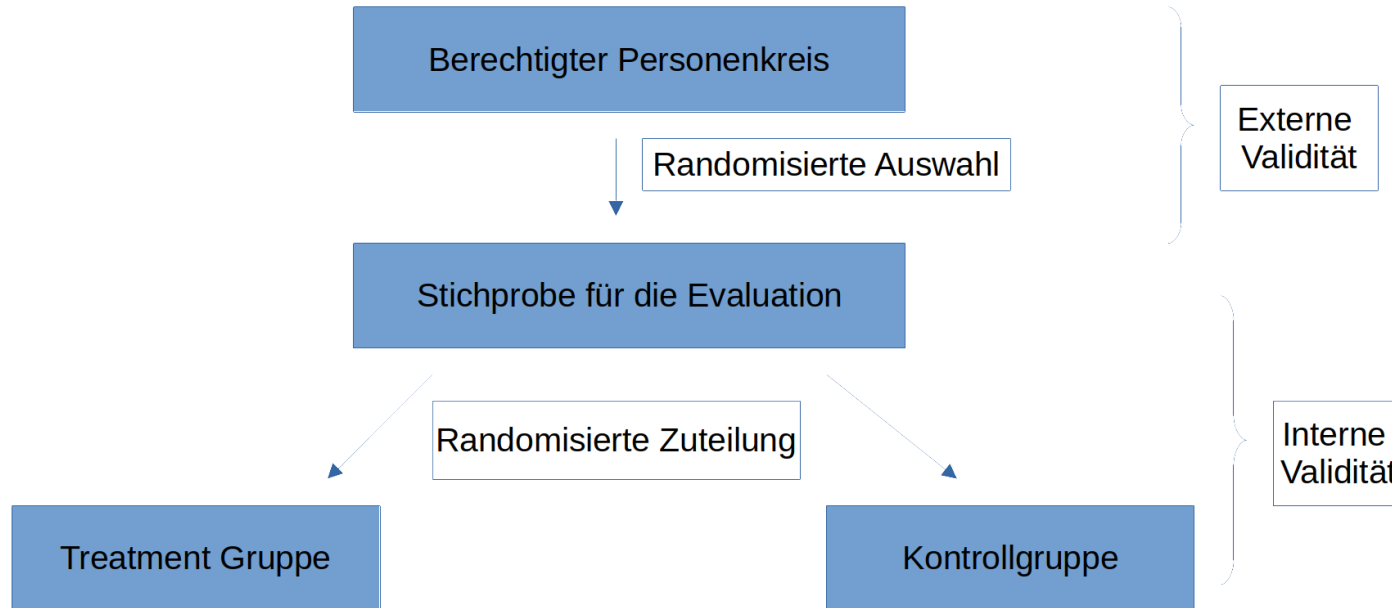
# Warum sollten wir *randomisieren*?

Mit einer ausreichend großen Stichprobe erhalten Sie durch Randomisierung Gruppen, die in ihren (pre-Treatment) Charakteristika gleich sind.

Übertragen auf ihr DAG bedeutet die Randomisierung: **Confounder beeinflussen ihr Treatment nicht!**



# Wie wird randomisiert?



# Validität

**Interne Validität:** Misst ihre Methodik das was sie tatsächlich herausfinden wollen? D.h. können Sie die Änderung von Y *kausal* auf die Änderung von X zurückführen?

**Externe Validität:** Lassen sich die Ergebnisse auch auf andere Datensätze übertragen/generalisieren?



# Validität

**Interne Validität:** Misst ihre Methodik das was sie tatsächlich herausfinden wollen? D.h. können Sie die Änderung von Y *kausal* auf die Änderung von X zurückführen?

**Externe Validität:** Lassen sich die Ergebnisse auch auf andere Datensätze übertragen/generalisieren?

Uns interessiert insbesondere die *interne Validität* unserer Ergebnisse!

# Probleme für die interne Validität

- + **Omitted Variables Bias:** Selbstselektion, Attrition (Schwund)
- + **Trends in den Daten:** Reifung, Globale Trends, Saisonalität, Wiederholung, Regression zur Mitte
- + **Kalibrierung der Studie:** Messfehler, Zeitrahmen
- + **Kontamination:** Hawthorne, John Henry, Spillovers

# Ommitted Variable Bias

## Selbstselektion

- + Problem: Personen können selbst entscheiden ob (oder wann) Sie an einem Programm teilnehmen oder nicht
- + Lösung: Randomisierung in Treatment und Kontrollgruppe und über die Zeit

## Attrition (Schwund)

- + Problem: Personen die das Experiment verlassen sind unterschiedlich zu denen die bleiben
- + *Überprüfung*: Wie ähnlich sind die Personen die bleiben zu denen die gehen auf Basis beobachtbarer Charakteristika?

# Trends in den Daten

## Reifung

- + Problem: Personen ändern sich alleine durch zunehmendes Alter zwischen zwei Messungen
- + Lösung: Kontrollgruppe verwenden um den Trend heraus rechnen zu können

## Globale Trends

- + Problem: Globale Ereignisse können die Änderung in den Daten erklären
- + Lösung: Kontrollgruppe verwenden um den Trend heraus rechnen zu können

## Saisonalität

- + Problem: Änderungen in den Daten basieren auf saisonalen Schwankungen
- + Lösung: Beobachtungen aus der gleichen Periode miteinander vergleichen

# Trends in den Daten

## Wiederholung

- + Problem: Personen lernen natürlicherweise, wenn Sie immer den gleichen Fragen/Aufgaben ausgesetzt sind
- + Lösung: Tests verändern, Kontrollgruppen verwenden

## Regression zur Mitte

- + Problem: Extreme Beobachtungen werden mit der Zeit weniger Extrem (Glück, Pech ...)
- + Lösung: Keine Ausreiser selektieren, Randomisierung

# Kalibrierung der Studie

## Falsche Messung

- + Problem: Der Output wird nicht richtig gemessen
- + Lösung: Output muss richtig gemessen werden

## Zeitraumen

- + Problem: Studie ist zu kurz (oder zu lange) angelegt
- + Lösung: Richtigen Zeitrahmen anlegen

# Kontamination

## Hawthorne Effekt

- + Problem: Personen verhalten sich unterschiedlich wenn diese beobachtet werden
- + Lösung: Versteckte Kontrollgruppen verwenden?

## John Henry Effekt

- + Problem: Kontrollgruppe arbeitet sehr hart um zu zeigen das sie so gut wie die Treatment Gruppe sind
- + Lösung: Kontroll und Treatmentgruppe separat halten

## Spillover Effekt

- + Problem: Kontrollgruppe lernt über die Zeit von der Treatment Gruppe
- + Lösung: Räumlich getrennte Kontrollgruppen verwenden

# Randomisiertes Experiment

Randomisierung löst viele Probleme der internen Validität!

Wie lassen sich die Ergebnisse eines Experiments interpretieren?



# Randomisiertes Experiment

Randomisierung löst viele Probleme der internen Validität!

Wie lassen sich die Ergebnisse eines Experiments interpretieren?

Schritt 1: Untersuchen Sie ob die demographischen Faktoren und andere Charakteristika zwischen Treatment und Kontrollgruppe ähnlich sind (gebalanced)

Schritt 2: Untersuchen Sie die durchschnittlichen Differenzen im Ergebnis zwischen Treatment und Kontrollgruppe

# Experiment - Wochenbettdepressionen

Wir wollen uns einem Experiment zuwenden, dessen zeitliche Abfolge Sie hier sehen:

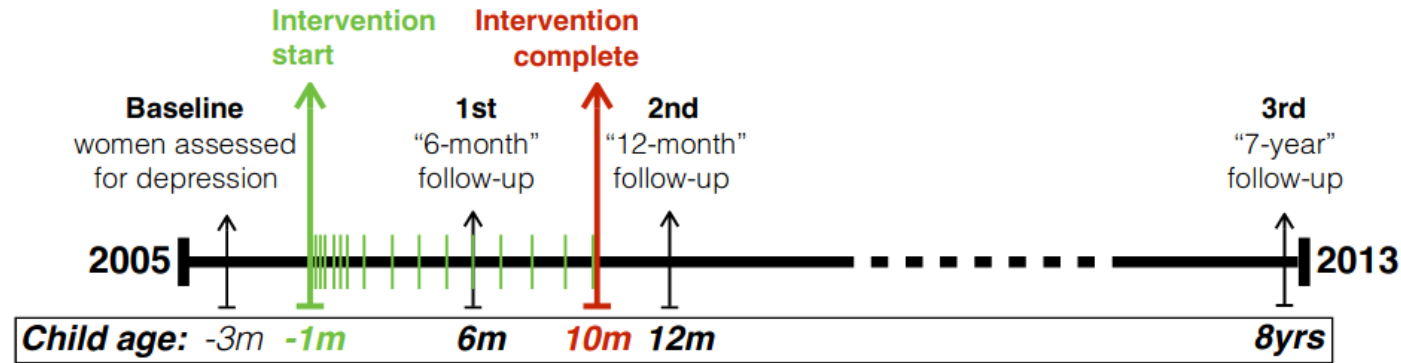


FIGURE 1. TIMELINE OF INTERVENTION AND FOLLOW-UPS

Quelle: Baranov, Victoria, Sonia Bhalotra, Pietro Biroli, and Joanna Maselko. 2020. "Maternal Depression, Women's Empowerment, and Parental Investment: Evidence from a Randomized Controlled Trial." *American Economic Review*, 110 (3): 824-59.

# Experiment - Wochenbettdepressionen

## Was sind Wochenbettdepressionen?

**Postpartale Stimmungskrisen** (von lat. partus Geburt, Entbindung) beschreiben psychische Zustände oder Störungen, die in einem **zeitlichen Zusammenhang mit dem Wochenbett** auftreten (lat. post = nach; partus = Entbindung, Trennung).[1]  
Die Bandbreite der im Wochenbett auftretenden affektiven Zustände reicht von einer leichten Traurigkeit über Depressionen bis hin zu schweren psychotischen Erkrankungen.

Quelle: Wikipedia

# Experiment - Wochenbettdepressionen

## Was sind Wochenbettdepressionen?

**Postpartale Stimmungskrisen** (von lat. partus Geburt, Entbindung) beschreiben psychische Zustände oder Störungen, die in einem **zeitlichen Zusammenhang mit dem Wochenbett** auftreten (lat. post = nach; partus = Entbindung, Trennung).[1]  
Die Bandbreite der im Wochenbett auftretenden affektiven Zustände reicht von einer leichten Traurigkeit über Depressionen bis hin zu schweren psychotischen Erkrankungen.

Quelle: Wikipedia

Die Folgen einer Wochenbettdepression können langfristige Effekte auf die ganze Familie haben. Neben den negativen Folgen für die Gesundheit der Frau und des Kindes, verursachen Depressionen auch hohe wirtschaftliche Kosten.

# Experiment - Wochenbettdepressionen

```
thp <- read_csv("../case-study/data/THP_clean.csv")

thp %>%
  select(treat, depressed_1y, age_baseline, kids_no, first_child, employed_mo_baseline, MIL, maternal_gamma) %>%
  glimpse()
```

```
Rows: 1,203
Columns: 10
$ treat                <dbl> 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1...
$ depressed_1y         <dbl> 1, 0, NA, 0, NA, 1, 1, 0, 0, 0, NA, 0, 0, 0, 0, 0...
$ age_baseline         <dbl> 28, 37, NA, 29, NA, 23, 30, 22, 30, 25, NA, 27, 2...
$ kids_no              <dbl> 3, 6, NA, 2, NA, 1, 3, 0, 4, 1, NA, 2, 2, 1, 2, 3...
$ first_child          <dbl> 0, 0, 1, 0, 1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 1...
$ employed_mo_baseline <dbl> 0, 0, NA, 0, NA, 0, 0, 0, 0, 0, NA, 0, 0, 0, 0, 0...
$ MIL                  <dbl> 1, 0, NA, 0, NA, 1, 0, 0, 0, 1, NA, 0, 1, 1, 0, 0...
$ maternal_gamma       <dbl> 0, 0, NA, 0, NA, 0, 0, 0, 0, 0, NA, 1, 0, 0, 0, 0...
$ edu_fa_baseline      <dbl> 10, 8, NA, 10, NA, 10, 0, 7, 8, 10, NA, 10, 10, 8...
$ employed_fa_baseline <dbl> 1, 0, NA, 1, NA, 1, 1, 1, NA, 1, NA, 1, 0, 1, 1, ...
```

# Schritt 1: Unterschiede untersuchen

count: false

```
thp
```

```
# A tibble: 1,203 × 394
  newid interviewer    uc grandmother employed_mo income
  <dbl>      <dbl> <dbl> <chr>          <chr>          <d
1     NA         NA     1 <NA>          <NA>
2    226         1     1 No            No
3    222         6     1 Yes           No
4     3         1     1 No            No
5    217         3     1 No            No
6    354         1     1 Yes           No
7     NA         NA     1 <NA>          <NA>
8     NA         NA     1 <NA>          <NA>
9    225         4     1 No            No
10    2         4     1 Yes           No
# i 1,193 more rows
# i 386 more variables: edu_mo <dbl>, edu_fa <dbl>, ideal
# no_kids_over5_dead <dbl>, no_kids_1_5_dead <dbl>, no_
# mo_185 <chr>, mo_358 <chr>, mo_360 <chr>, c_wt <dbl>,
# ch_27 <chr>, ch_28 <chr>, ch_29 <chr>, ch_30 <chr>, c
# ch_32 <chr>, ch_33 <chr>, ch_34 <chr>, ch_35 <chr>, c
# mo_ht <dbl>, mo_bmi <dbl>, hamd_baseline <dbl>, bdq_b
```

```
thp %>%
```

```
  filter(THP_sample==1)
```

```
# A tibble: 903 × 394
```

|    | newid | interviewer | uc    | grandmother | employed_mo | income |
|----|-------|-------------|-------|-------------|-------------|--------|
|    | <dbl> | <dbl>       | <dbl> | <chr>       | <chr>       | <d     |
| 1  | NA    | NA          | 1     | <NA>        | <NA>        |        |
| 2  | 226   | 1           | 1     | No          | No          |        |
| 3  | 3     | 1           | 1     | No          | No          |        |
| 4  | 354   | 1           | 1     | Yes         | No          |        |
| 5  | NA    | NA          | 1     | <NA>        | <NA>        |        |
| 6  | NA    | NA          | 1     | <NA>        | <NA>        |        |
| 7  | 225   | 4           | 1     | No          | No          |        |
| 8  | 2     | 4           | 1     | Yes         | No          |        |
| 9  | 729   | 1           | 1     | No          | No          |        |
| 10 | NA    | NA          | 1     | <NA>        | <NA>        |        |

```
# i 893 more rows
```

```
# i 386 more variables: edu_mo <dbl>, edu_fa <dbl>, ideal  
# no_kids_over5_dead <dbl>, no_kids_1_5_dead <dbl>, no_  
# mo_185 <chr>, mo_358 <chr>, mo_360 <chr>, c_wt <dbl>,  
# ch_27 <chr>, ch_28 <chr>, ch_29 <chr>, ch_30 <chr>, c  
# ch_32 <chr>, ch_33 <chr>, ch_34 <chr>, ch_35 <chr>, c  
# mo_ht <dbl>, mo_bmi <dbl>, hamd_baseline <dbl>, bdq_b
```

```
thp %>%
  filter(THP_sample==1) %>%
  select( treat, depressed_1y, age_ba
```

```
# A tibble: 903 × 10
  treat depressed_1y age_baseline kids_no first_child em
  <dbl>         <dbl>         <dbl>    <dbl>    <dbl>    <dbl>
1     1           1           28         3         0
2     1           0           37         6         0
3     1           0           29         2         0
4     1           1           23         1         0
5     1           1           30         3         0
6     1           0           22         0         1
7     1           0           30         4         0
8     1           0           25         1         0
9     1           0           27         2         0
10    1           0           26         2         0
# i 893 more rows
# i 4 more variables: MIL <dbl>, maternalgma <dbl>, edu_f
# employed_fa_baseline <dbl>
```



```
thp %>%
  filter(THP_sample==1) %>%
  select( treat, depressed_1y, age_ba
  pivot_longer(cols = -treat, names_t
```

```
# A tibble: 8,127 × 3
  treat variable      value
  <dbl> <chr>         <dbl>
1     1 depressed_1y         1
2     1 age_baseline      28
3     1 kids_no           3
4     1 first_child        0
5     1 employed_mo_baseline 0
6     1 MIL                1
7     1 maternalgma         0
8     1 edu_fa_baseline     10
9     1 employed_fa_baseline  1
10    1 depressed_1y        0
# i 8,117 more rows
```

```
thp %>%
  filter(THP_sample==1) %>%
  select( treat, depressed_1y, age_ba
  pivot_longer(cols = -treat, names_t
  group_nest(variable)
```

```
# A tibble: 9 × 2
  variable                data
  <chr>                  <list<tibble[,2]>>
1 MIL                    [903 × 2]
2 age_baseline           [903 × 2]
3 depressed_1y           [903 × 2]
4 edu_fa_baseline        [903 × 2]
5 employed_fa_baseline   [903 × 2]
6 employed_mo_baseline   [903 × 2]
7 first_child            [903 × 2]
8 kids_no                [903 × 2]
9 maternalgma            [903 × 2]
```

```
thp %>%
  filter(THP_sample==1) %>%
  select( treat, depressed_1y, age_ba
  pivot_longer(cols = -treat, names_t
  group_nest(variable) %>%
  mutate(t.test = map(data, ~tidy(t.t
```

```
# A tibble: 9 × 3
  variable                data t.test
  <chr>                <list<tibble[,2]>> <list>
1 MIL                  [903 × 2] <tibble [1 × 10
2 age_baseline         [903 × 2] <tibble [1 × 10
3 depressed_1y         [903 × 2] <tibble [1 × 10
4 edu_fa_baseline      [903 × 2] <tibble [1 × 10
5 employed_fa_baseline [903 × 2] <tibble [1 × 10
6 employed_mo_baseline [903 × 2] <tibble [1 × 10
7 first_child          [903 × 2] <tibble [1 × 10
8 kids_no              [903 × 2] <tibble [1 × 10
9 maternalgma          [903 × 2] <tibble [1 × 10
```

```
thp %>%
  filter(THP_sample==1) %>%
  select( treat, depressed_1y, age_ba
  pivot_longer(cols = -treat, names_t
  group_nest(variable) %>%
  mutate(t.test = map(data, ~tidy(t.t
  unnest(t.test)
```

```
# A tibble: 9 × 12
  variable      data estimate estimate1 estimate2 stati
  <chr>      <list<ti>    <dbl>      <dbl>      <dbl>      <
1 MIL      [903 × 2] -0.0642      0.402      0.467      -1
2 age_basel... [903 × 2]  0.505      27        26.5       1
3 depressed... [903 × 2]  0.316      0.589      0.273       9
4 edu_fa_ba... [903 × 2]  0.134      7.09      6.95       0
5 employed_... [903 × 2]  0.0124     0.913      0.901       0
6 employed_... [903 × 2]  0.0125     0.0341     0.0216      1
7 first_chi... [903 × 2] -0.00586    0.186      0.192      -0
8 kids_no     [903 × 2]  0.172      2.33      2.16       1
9 maternalg... [903 × 2] -0.0299     0.05      0.0799     -1
# i 4 more variables: conf.low <dbl>, conf.high <dbl>, me
# alternative <chr>
```

```
thp %>%
  filter(THP_sample==1) %>%
  select( treat, depressed_1y, age_ba
  pivot_longer(cols = -treat, names_t
  group_nest(variable) %>%
  mutate(t.test = map(data, ~tidy(t.t
  unnest(t.test) %>%
  mutate( Mean_Treatment = round(esti
           Mean_Kontrolle = round(esti
           Differenz = -round(estimate, 2),
           Signifikanz = round(p.value
```

```
# A tibble: 9 × 16
  variable      data estimate estimate1 estimate2 stati
  <chr>      <list<ti>    <dbl>      <dbl>      <dbl>      <
1 MIL      [903 × 2] -0.0642      0.402      0.467      -1
2 age_basel... [903 × 2]  0.505      27        26.5       1
3 depressed... [903 × 2]  0.316      0.589      0.273      9
4 edu_fa_ba... [903 × 2]  0.134      7.09      6.95       0
5 employed_... [903 × 2]  0.0124     0.913      0.901      0
6 employed_... [903 × 2]  0.0125     0.0341     0.0216     1
7 first_chi... [903 × 2] -0.00586    0.186      0.192     -0
8 kids_no     [903 × 2]  0.172      2.33      2.16       1
9 maternalg... [903 × 2] -0.0299     0.05      0.0799     -1
# i 8 more variables: conf.low <dbl>, conf.high <dbl>, me
# alternative <chr>, Mean_Treatment <dbl>, Mean_Kontrol
# Differenz <dbl>, Signifikanz <dbl>
```

```
thp %>%
  filter(THP_sample==1) %>%
  select( treat, depressed_1y, age_ba
  pivot_longer(cols = -treat, names_t
  group_nest(variable) %>%
  mutate(t.test = map(data, ~tidy(t.t
  unnest(t.test) %>%
  mutate( Mean_Treatment = round(esti
          Mean_Kontrolle = round(esti
          Differenz = -round(estimate, 2),
          Signifikanz = round(p.value
  select( Mean_Treatment, Mean_Kontrc
```

```

thp %>%
  filter(THP_sample==1) %>%
  select( treat, depressed_1y, age_ba
  pivot_longer(cols = -treat, names_t
  group_nest(variable) %>%
  mutate(t.test = map(data, ~tidy(t.t
  unnest(t.test) %>%
  mutate( Mean_Treatment = round(esti
          Mean_Kontrolle = round(esti
          Differenz = -round(estimate, 2),
          Signifikanz = round(p.value
  select( Mean_Treatment, Mean_Kontrc

total$name <- c("Stiefoma im Haus", "

```

```
thp %>%
  filter(THP_sample==1) %>%
  select( treat, depressed_1y, age_ba
  pivot_longer(cols = -treat, names_t
  group_nest(variable) %>%
  mutate(t.test = map(data, ~tidy(t.t
  unnest(t.test) %>%
  mutate( Mean_Treatment = round(esti
          Mean_Kontrolle = round(esti
          Differenz = -round(estimate, 2),
          Signifikanz = round(p.value
  select( Mean_Treatment, Mean_Kontrc

total$name <- c("Stiefoma im Haus", "
```

```
total
```

```
# A tibble: 9 × 5
  Mean_Treatment Mean_Kontrolle Differenz Signifikanz nam
      <dbl>         <dbl>      <dbl>      <dbl> <ch
1         0.47          0.4        0.06        0.05 Sti
2        26.5          27        -0.51        0.14 Alt
3         0.27          0.59       -0.32         0    Dep
4         6.95          7.09       -0.13        0.61 Bil
5         0.9           0.91       -0.01        0.53 Vat
6         0.02          0.03       -0.01        0.26 Mut
7         0.19          0.19         0.01        0.82 Ers
8         2.16          2.33       -0.17        0.15 Anz
9         0.08          0.05         0.03        0.07 Oma
```



```

thp %>%
  filter(THP_sample==1) %>%
  select( treat, depressed_1y, age_ba
  pivot_longer(cols = -treat, names_t
  group_nest(variable) %>%
  mutate(t.test = map(data, ~tidy(t.t
  unnest(t.test) %>%
  mutate( Mean_Treatment = round(esti
          Mean_Kontrolle = round(esti
          Differenz = -round(estimate, 2),
          Signifikanz = round(p.value
  select( Mean_Treatment, Mean_Kontrc

total$name <- c("Stiefoma im Haus", "

total %>%
  select(name, everything())

```

```

# A tibble: 9 × 5
  name                               Mean_Treatment Mean_Kontrolle Differ
<chr>                               <dbl>           <dbl>      <d
1 Stiefoma im Haus                   0.47            0.4        0
2 Alter der Mutter                   26.5            27         -0
3 Depressiv (1 Jahr)                 0.27            0.59       -0
4 Bildung des Vaters                 6.95            7.09       -0
5 Vater beschäftigt                 0.9             0.91       -0
6 Mutter beschäftigt                0.02            0.03       -0
7 Erstes Kind                       0.19            0.19        0
8 Anzahl der Kinder                 2.16            2.33       -0
9 Oma im Haus                       0.08            0.05        0

```

```

thp %>%
  filter(THP_sample==1) %>%
  select( treat, depressed_1y, age_ba
  pivot_longer(cols = -treat, names_t
  group_nest(variable) %>%
  mutate(t.test = map(data, ~tidy(t.t
  unnest(t.test) %>%
  mutate( Mean_Treatment = round(esti
          Mean_Kontrolle = round(esti
          Differenz = -round(estimate, 2),
          Signifikanz = round(p.value
  select( Mean_Treatment, Mean_Kontroc

total$name <- c("Stiefoma im Haus", "

total %>%
  select(name, everything()) %>%
  kbl(col.names = c(" ", "Treatment",
  caption = "Balancing Tabelle fü

```

Balancing Tabelle für die Grundcharakteristika

|                    | Treatment | Kontrolle | Differenz | p-Wert |
|--------------------|-----------|-----------|-----------|--------|
| Stiefoma im Haus   | 0.47      | 0.40      | 0.06      | 0.05   |
| Alter der Mutter   | 26.49     | 27.00     | -0.51     | 0.14   |
| Depressiv (1 Jahr) | 0.27      | 0.59      | -0.32     | 0.00   |
| Bildung des Vaters | 6.95      | 7.09      | -0.13     | 0.61   |
| Vater beschäftigt  | 0.90      | 0.91      | -0.01     | 0.53   |
| Mutter beschäftigt | 0.02      | 0.03      | -0.01     | 0.26   |
| Erstes Kind        | 0.19      | 0.19      | 0.01      | 0.82   |
| Anzahl der Kinder  | 2.16      | 2.33      | -0.17     | 0.15   |
| Oma im Haus        | 0.08      | 0.05      | 0.03      | 0.07   |

```

thp %>%
  filter(THP_sample==1) %>%
  select( treat, depressed_1y, age_ba
pivot_longer(cols = -treat, names_t
group_nest(variable) %>%
mutate(t.test = map(data, ~tidy(t.t
unnest(t.test) %>%
mutate( Mean_Treatment = round(esti
        Mean_Kontrolle = round(esti
        Differenz = -round(estimate, 2),
        Signifikanz = round(p.value
select( Mean_Treatment, Mean_Kontrc

total$name <- c("Stiefoma im Haus", "

total %>%
  select(name, everything()) %>%
  kbl(col.names = c(" ", "Treatment",
        caption = "Balancing Tabelle fü
kable_styling(bootstrap_options = c

```

## Balancing Tabelle für die Grundcharakteristika

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  kable_styling(bootstrap_options = c
  kable_paper(full_width = F)

```

Balancing Tabelle für die Grundcharakteristika

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total %>%
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  kable_styling(bootstrap_options = c
  kable_paper(full_width = F) %>%
  add_header_above(c(" ", "Stichprobe

```

Balancing Tabelle für die Grundcharakteristika

Stichprobe Baseline (N = 903)

|                    | Treatment | Kontrolle | Differenz | p-Wert |
|--------------------|-----------|-----------|-----------|--------|
| Stiefoma im Haus   | 0.47      | 0.40      | 0.06      | 0.05   |
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total$name <- c("Stiefoma im Haus", "

total %>%
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  kable_styling(bootstrap_options = c
  kable_paper(full_width = F) %>%
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  footnote(general = "Diese Tabelle t

```

Balancing Tabelle für die Grundcharakteristika

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**Note:**

Diese Tabelle testet, wie ausbalanciert die Beobachtungen in der Baseline Stichprobe sind. In den ersten beiden Spalten wird der Mittelwert für die Treatment bzw. Kontrollgruppe für die Baseline Stichprobe gezeigt. Spalte (3) zeigen die Differenz zwischen den Mittelwerten der Treatment und Kontrollgruppe für die jeweilige Stichprobe und die Spalte (4) zeigt die p-Werte und damit ob die einzelnen Mittelwerte statistisch signifikant unterschiedlich voneinander sind.

```

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## SCHRITT 1: UNTERSCHIEDE UNTERSUCHEN

Balancing Tabelle für die Grundcharakteristika

Stichprobe Baseline (N = 903)

|                    | Treatment | Kontrolle | Differenz | p-Wert |
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| Anzahl der Kinder  | 2.16      | 2.33      | -0.17     | 0.15   |
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# Schritt 1: Unterschiede untersuchen

## Wann nutzt uns eine solche **Balancing Tabelle**?

Wir sollten eine solche Tabelle immer dann erstellen, wenn wir uns nicht ganz sicher sein können, ob unsere Randomisierung erfolgreich war, d.h. insbesondere bei der Untersuchung von Feldexperimenten.

- ✚ Wenn wir die Randomisierung nicht selbst durchgeführt haben, insbesondere in Feldexperimenten
- ✚ Bei *Attrition*, d.h. Schwund bei den Teilnehmern des Experiments

# Schritt 1: Unterschiede untersuchen

## Was lernen wir aus der Balancing Tabelle?

Aus dieser Balancing Tabelle lernen wir mehrere Dinge:

- ✚ In den meisten Grundcharakteristika unterscheiden sich Treatment und Kontrollgruppe **nicht** voneinander.
- ✚ Einige Variablen sind jedoch signifikant unterschiedlich zwischen Treatment und Kontrollgruppe, insbesondere ob die Oma väterlicherseits oder mütterlicherseits mit im Haushalt lebt.
- ✚ Wir verlieren einige Teilnehmer über die Zeit (903 -> 704 -> 585 Beobachtungen), d.h. wir haben nach 7 Jahren nur noch 64,8% der Mütter, die ursprünglich am Experiment teilgenommen haben, in der Stichprobe.

# Schritt 2: Durchschnittliche Differenzen

count: false

```
thp
```

```
# A tibble: 1,203 × 394
  newid interviewer    uc grandmother employed_mo income
  <dbl>      <dbl> <dbl> <chr>          <chr>          <d
1      NA         NA     1 <NA>          <NA>
2    226         1     1 No            No
3    222         6     1 Yes           No
4      3         1     1 No            No
5    217         3     1 No            No
6    354         1     1 Yes           No
7      NA         NA     1 <NA>          <NA>
8      NA         NA     1 <NA>          <NA>
9    225         4     1 No            No
10     2         4     1 Yes           No
# i 1,193 more rows
# i 386 more variables: edu_mo <dbl>, edu_fa <dbl>, ideal
# no_kids_over5_dead <dbl>, no_kids_1_5_dead <dbl>, no_
# mo_185 <chr>, mo_358 <chr>, mo_360 <chr>, c_wt <dbl>,
# ch_27 <chr>, ch_28 <chr>, ch_29 <chr>, ch_30 <chr>, c
# ch_32 <chr>, ch_33 <chr>, ch_34 <chr>, ch_35 <chr>, c
# mo_ht <dbl>, mo_bmi <dbl>, hamd_baseline <dbl>, bdq_b
```

```
thp %>%
```

```
  select(treat, depressed_6m, depressed_1y, depressed)
```

```
# A tibble: 1,203 × 4
```

|    | treat | depressed_6m | depressed_1y | depressed |
|----|-------|--------------|--------------|-----------|
|    | <dbl> | <dbl>        | <dbl>        | <dbl>     |
| 1  | 1     | 0            | 1            | NA        |
| 2  | 1     | 0            | 0            | 0         |
| 3  | 1     | NA           | NA           | 0         |
| 4  | 1     | 0            | 0            | 0         |
| 5  | 1     | NA           | NA           | 0         |
| 6  | 1     | 1            | 1            | 0         |
| 7  | 1     | 1            | 1            | NA        |
| 8  | 1     | 0            | 0            | NA        |
| 9  | 1     | 0            | 0            | 0         |
| 10 | 1     | 0            | 0            | 0         |

```
# i 1,193 more rows
```

```
thp %>%
  select(treat, depressed_6m, depress
  mutate(Baseline = 1)
```

```
# A tibble: 1,203 × 5
  treat depressed_6m depressed_1y depressed Baseline
  <dbl>         <dbl>         <dbl>         <dbl>         <dbl>
1     1           0           1           NA           1
2     1           0           0           0           1
3     1          NA          NA           0           1
4     1           0           0           0           1
5     1          NA          NA           0           1
6     1           1           1           0           1
7     1           1           1          NA           1
8     1           0           0          NA           1
9     1           0           0           0           1
10    1           0           0           0           1
# i 1,193 more rows
```

```
thp %>%
  select(treat, depressed_6m, depress
  mutate(Baseline = 1) %>%
  pivot_longer( cols = -treat, names_
```

```
# A tibble: 4,812 × 3
  treat name      depression
  <dbl> <chr>      <dbl>
1      1 depressed_6m      0
2      1 depressed_1y      1
3      1 depressed      NA
4      1 Baseline      1
5      1 depressed_6m      0
6      1 depressed_1y      0
7      1 depressed      0
8      1 Baseline      1
9      1 depressed_6m     NA
10     1 depressed_1y     NA
# i 4,802 more rows
```

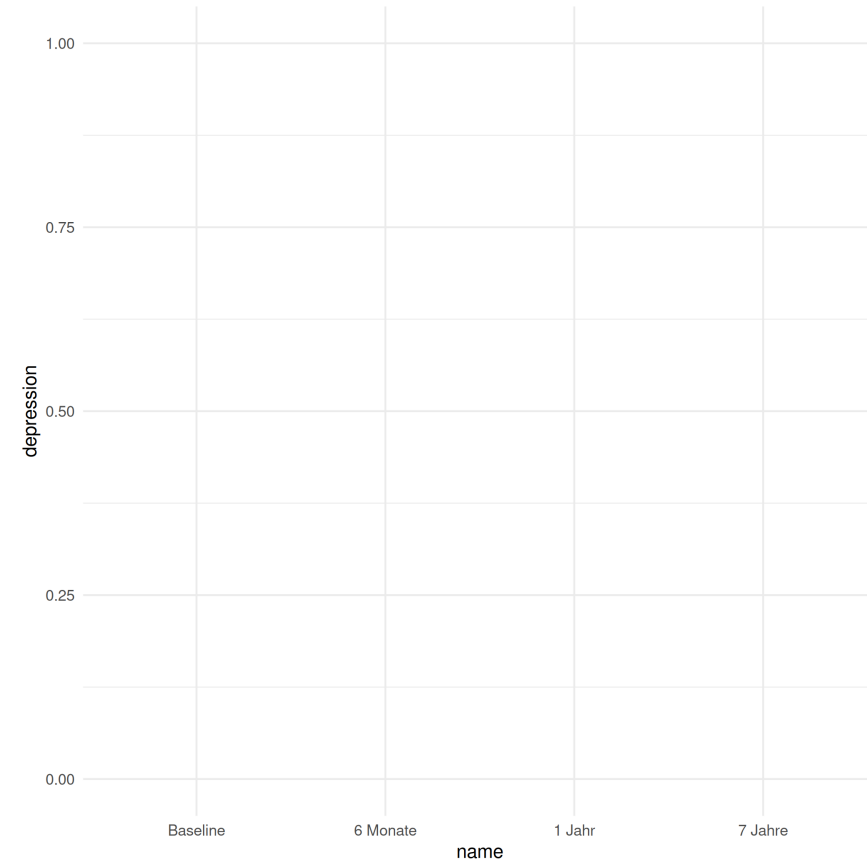
```
thp %>%
  select(treat, depressed_6m, depress
  mutate(Baseline = 1) %>%
  pivot_longer( cols = -treat, names_
  mutate(name = fct_relevel(name, "Ba
           name = fct_recode(name,
                               "6 Monate"
                               "1 Jahr" =
                               "7 Jahre"
           treat_factor = as.factor(ife
```

```
# A tibble: 4,812 × 4
  treat name      depression treat_factor
  <dbl> <fct>      <dbl> <fct>
1      1 6 Monate          0 Treatment
2      1 1 Jahr           1 Treatment
3      1 7 Jahre          NA Treatment
4      1 Baseline         1 Treatment
5      1 6 Monate          0 Treatment
6      1 1 Jahr           0 Treatment
7      1 7 Jahre          0 Treatment
8      1 Baseline         1 Treatment
9      1 6 Monate          NA Treatment
10     1 1 Jahr           NA Treatment
# i 4,802 more rows
```

```

thp %>%
  select(treat, depressed_6m, depressed_12m) %>%
  mutate(Baseline = 1) %>%
  pivot_longer( cols = -treat, names_to = "name", values_to = "depression")
  mutate(name = fct_relevel(name, "Baseline", "6 Monate", "1 Jahr", "7 Jahre"),
         name = fct_recode(name,
                           "Baseline" = "Baseline",
                           "6 Monate" = "6 Monate",
                           "1 Jahr" = "1 Jahr",
                           "7 Jahre" = "7 Jahre"),
         treat_factor = as.factor(treat))
ggplot(aes(x = name, y = depression, color = treat_factor))

```

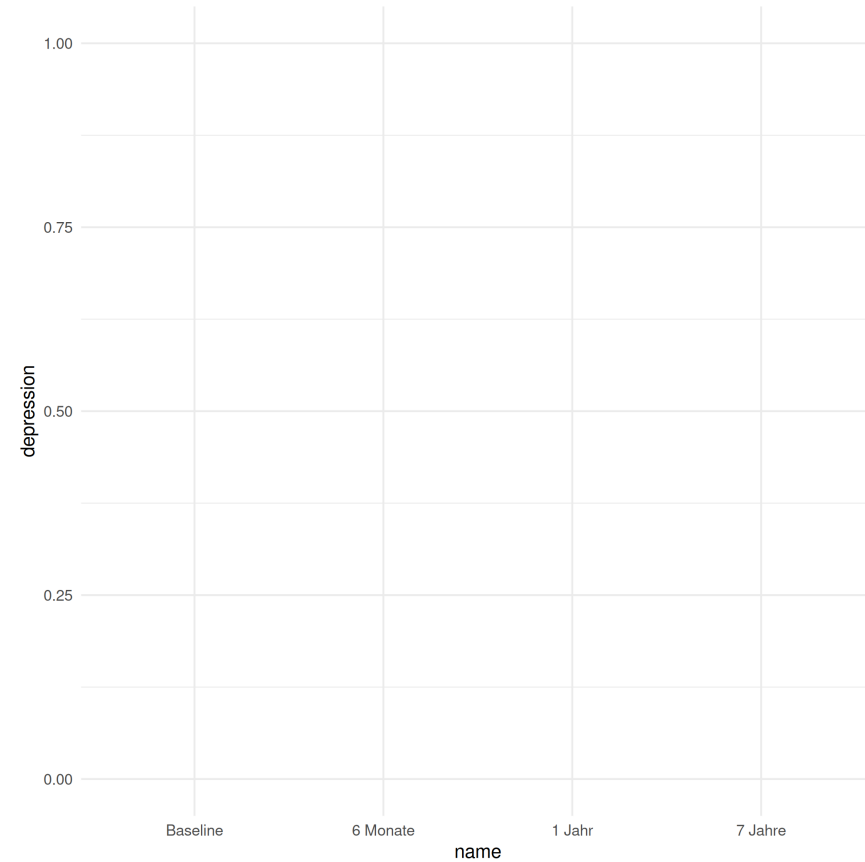




```

thp %>%
  select(treat, depressed_6m, depressed_12m) %>%
  mutate(Baseline = 1) %>%
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  mutate(name = fct_relevel(name, "Baseline", "6 Monate", "1 Jahr", "7 Jahre"),
         treat_factor = as.factor(treat)) %>%
  ggplot(aes(x = name, y = depression, color = treat_factor)) +
  scale_color_manual(values = c("#D55E00", "#4682B4"))

```

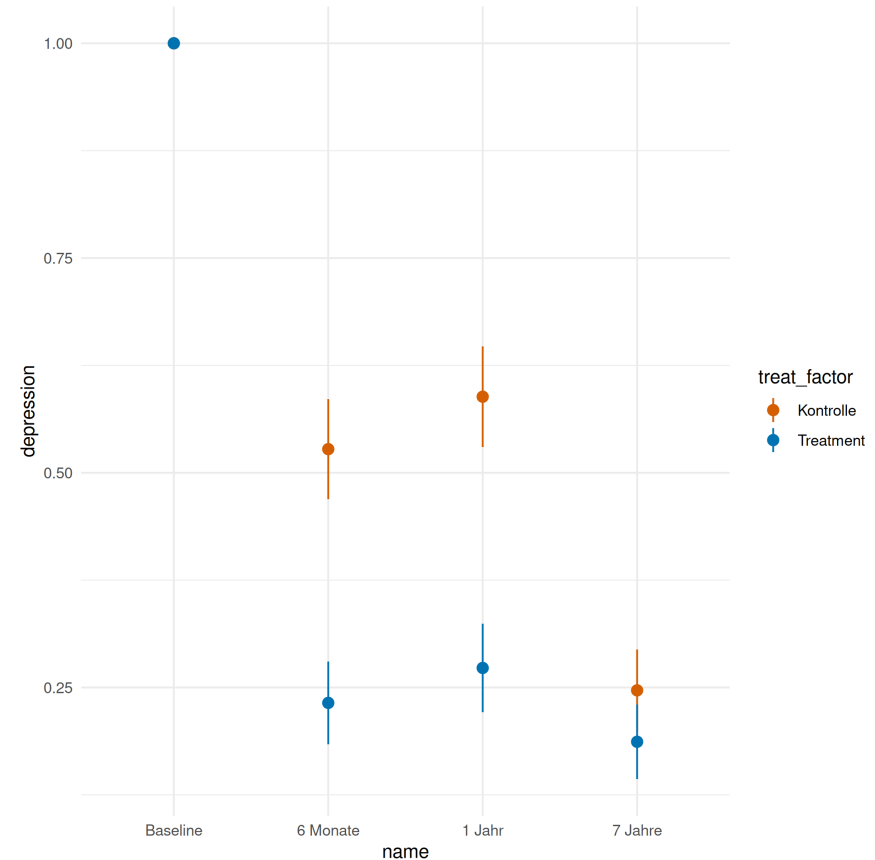


```

thp %>%
  select(treat, depressed_6m, depress
  mutate(Baseline = 1) %>%
  pivot_longer( cols = -treat, names_
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                               "6 Monate"
                               "1 Jahr" =
                               "7 Jahre"

           treat_factor = as.factor(ife
  ggplot(aes(x = name, y = depression
           color = treat_factor)) +
  scale_color_manual(values = c("#D55
  stat_summary(geom = "pointrange",
               fun.data = "mean_se",
               fun.args = list(mult=2

```

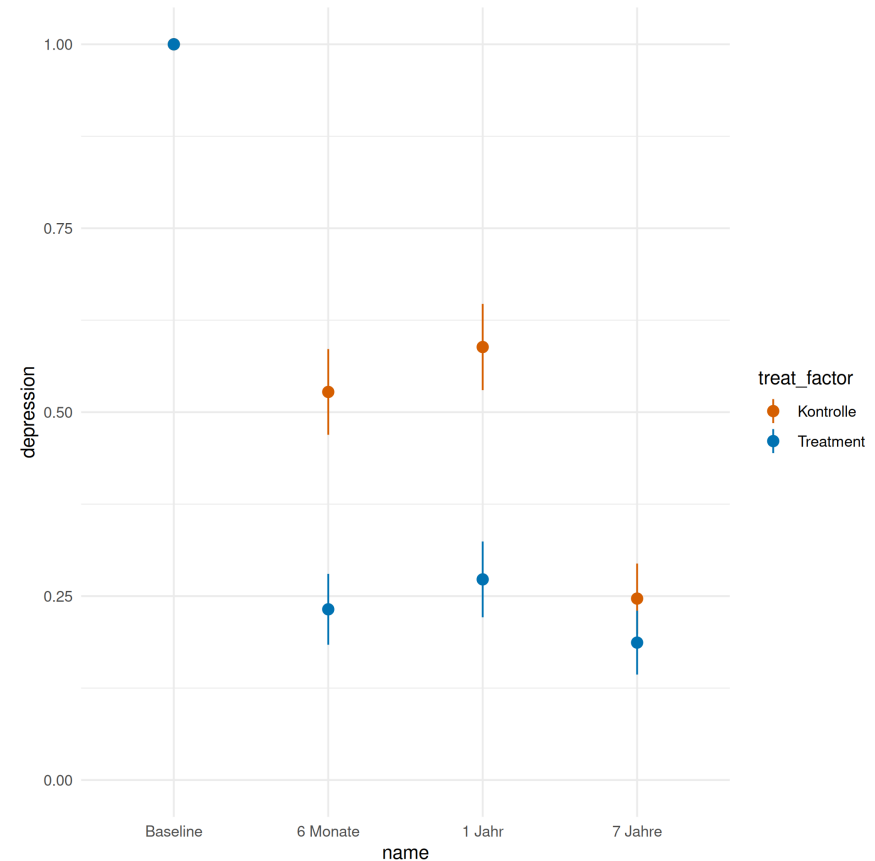


```

thp %>%
  select(treat, depressed_6m, depress
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               fun.data = "mean_se",
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ylim(0,1)

```



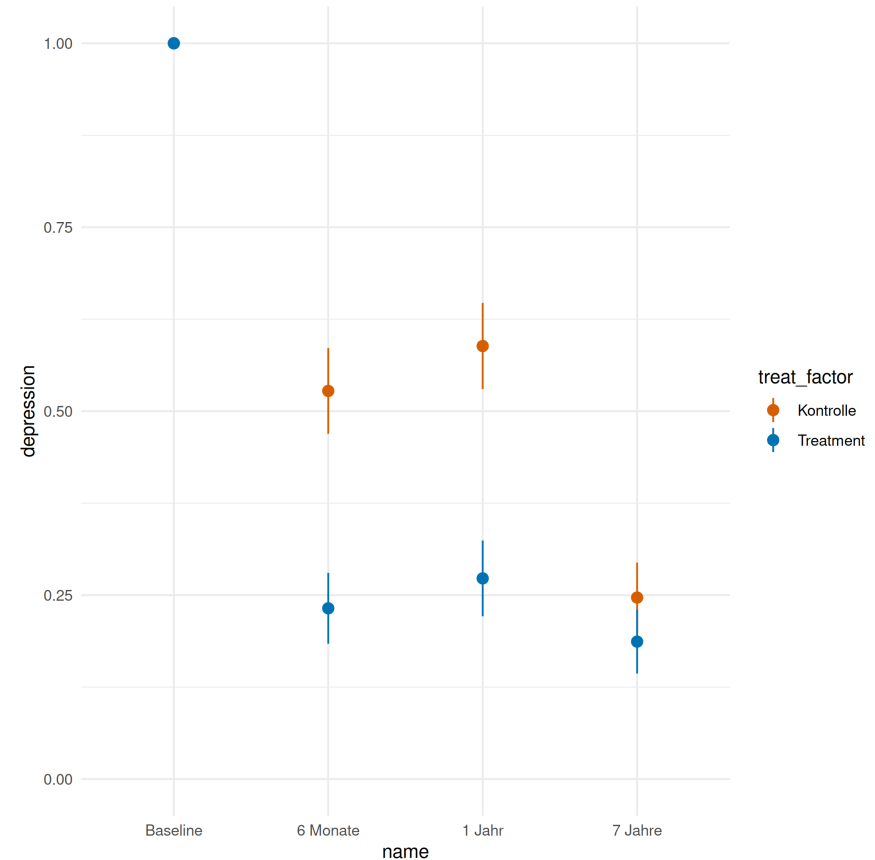
```

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  mutate(Baseline = 1) %>%
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  stat_summary(geom = "pointrange",
               fun.data = "mean_se",
               fun.args = list(mult=2

  ylim(0,1) +
  theme_minimal()

```



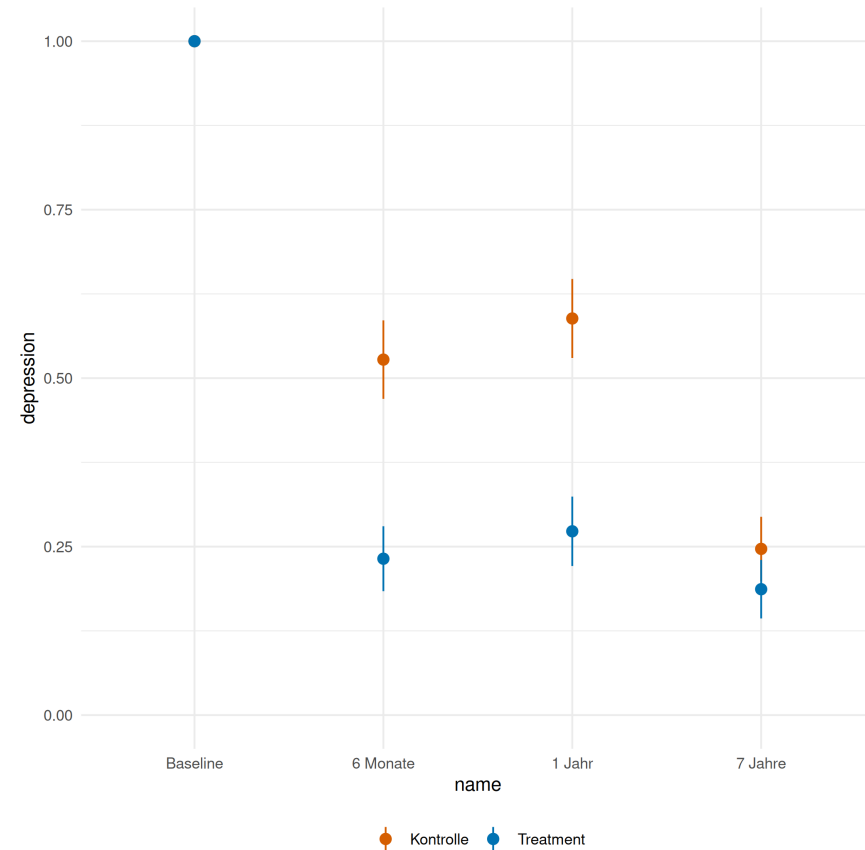
```

thp %>%
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ylim(0,1) +
theme_minimal() +
theme(legend.title = element_blank(
      legend.position = "bottom")

```



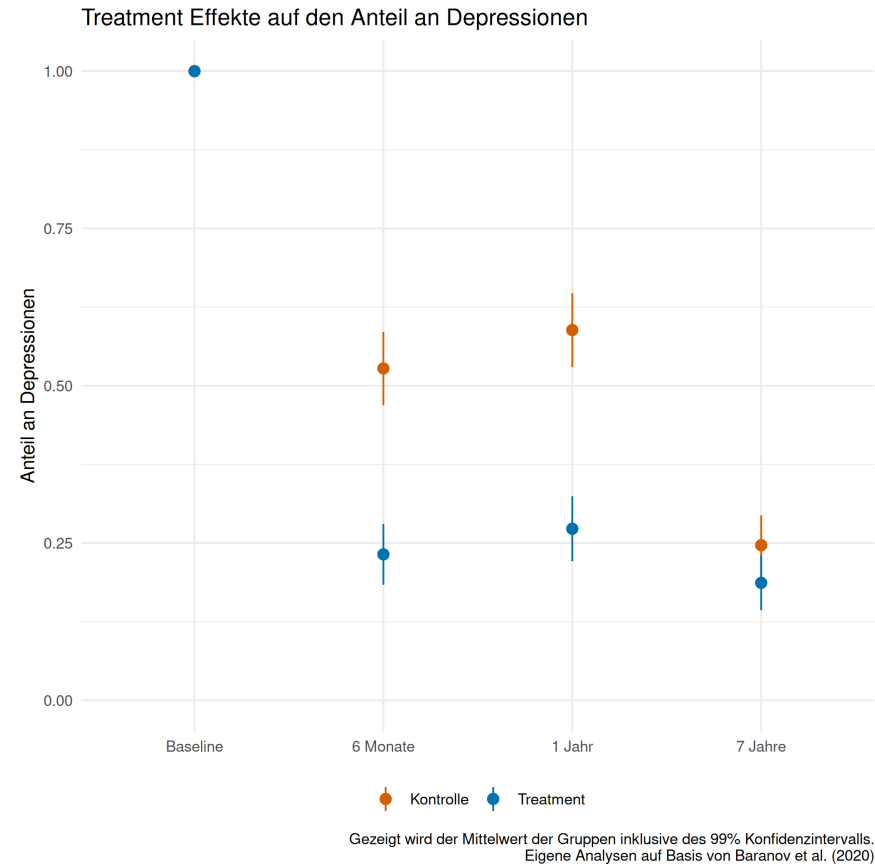
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  ylim(0,1) +
  theme_minimal() +
  theme(legend.title = element_blank(
           legend.position = "bottom") +
  labs(x = NULL,
       y = "Anteil an Depressionen",
       title = "Treatment Effekte auf
       caption = "Gezeigt wird der Mi

```



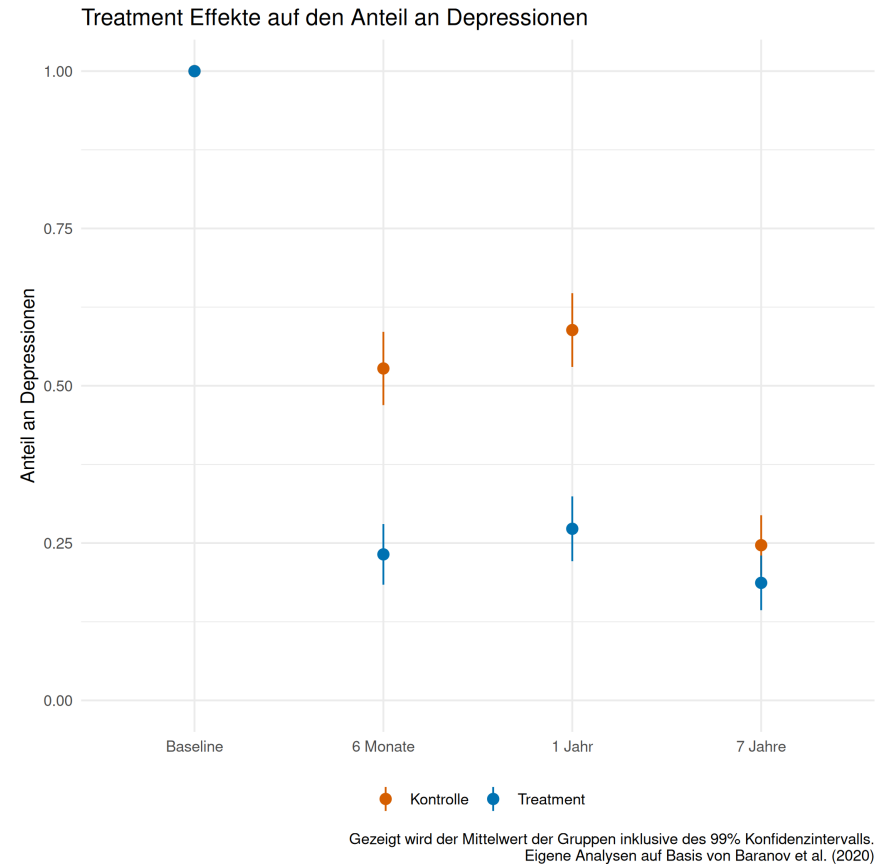
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  mutate(Baseline = 1) %>%
  pivot_longer( cols = -treat, names_
  mutate(name = fct_relevel(name, "Ba
           name = fct_recode(name,
                               "6 Monate"
                               "1 Jahr" =
                               "7 Jahre"

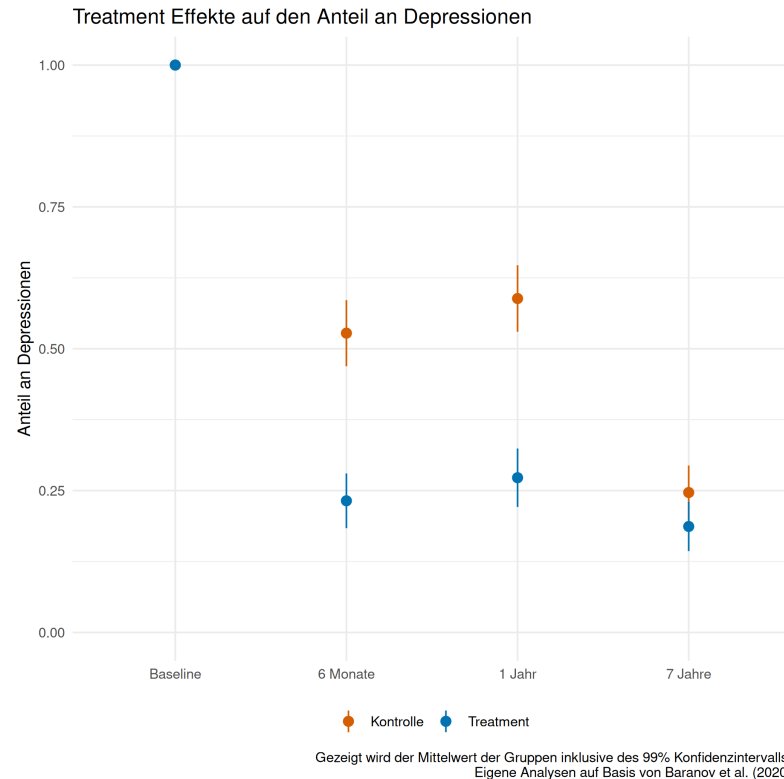
           treat_factor = as.factor(ife
  ggplot(aes(x = name, y = depression
           color = treat_factor)) +
  scale_color_manual(values = c("#D55
  stat_summary(geom = "pointrange",
               fun.data = "mean_se",
               fun.args = list(mult=2

  ylim(0,1) +
  theme_minimal() +
  theme(legend.title = element_blank(
           legend.position = "bottom") +
  labs(x = NULL,
        y = "Anteil an Depressionen",
        title = "Treatment Effekte auf
        caption = "Gezeigt wird der Mi

```



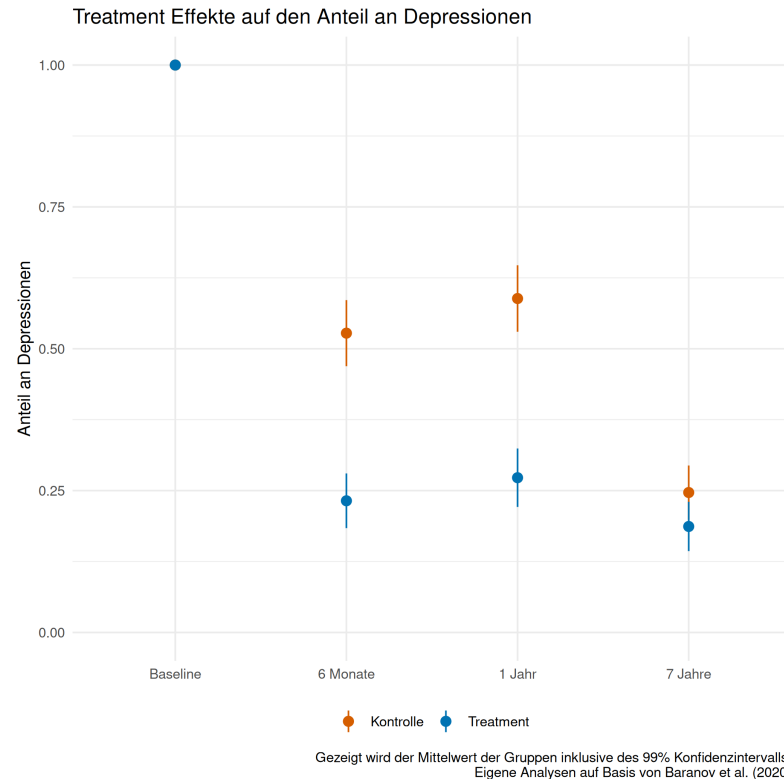
# Schritt 2: Durchschnittliche Differenzen



- + Die Treatmentgruppe hat einen sehr raschen Rückgang bei den Depressionen
  - + Bereits nach 6 Monaten auf rund 25%
  - + Stagniert auf rund 25% auch nach einem Jahr
  - + Geht zurück auf unter 20% nach sieben Jahren
- + Die Kontrollgruppe verzeichnet auch einen starken Rückgang der Depressionen
  - + Nach 6 Monaten auf etwas mehr als 50%
  - + Stagniert bei etwas über 50% auch nach einem Jahr
  - + Geht zurück auf rund 25% nach sieben Jahren



# Schritt 2: Durchschnittliche Differenzen



- + Die Treatmentgruppe hat einen sehr raschen Rückgang bei den Depressionen
  - + Bereits nach 6 Monaten auf rund 25%
  - + Stagniert auf rund 25% auch nach einem Jahr
  - + Geht zurück auf unter 20% nach sieben Jahren
- + Die Kontrollgruppe verzeichnet auch einen starken Rückgang der Depressionen
  - + Nach 6 Monaten auf etwas mehr als 50%
  - + Stagniert bei etwas über 50% auch nach einem Jahr
  - + Geht zurück auf rund 25% nach sieben Jahren

Ein naiver Vergleich nur innerhalb der Treatmentgruppe vorher/nachher würde den Effekt des Treatments stark überschätzen!

# Regressionsanalysen

# Schritt 2: Durchschnittliche Differenzen

count: false

```
thp
```

```
# A tibble: 1,203 × 394
  newid interviewer    uc grandmother employed_mo income
  <dbl>      <dbl> <dbl> <chr>          <chr>          <d
1     NA         NA     1 <NA>          <NA>
2    226         1     1 No            No
3    222         6     1 Yes           No
4     3         1     1 No            No
5    217         3     1 No            No
6    354         1     1 Yes           No
7     NA         NA     1 <NA>          <NA>
8     NA         NA     1 <NA>          <NA>
9    225         4     1 No            No
10    2         4     1 Yes           No
# i 1,193 more rows
# i 386 more variables: edu_mo <dbl>, edu_fa <dbl>, ideal
# no_kids_over5_dead <dbl>, no_kids_1_5_dead <dbl>, no_
# mo_185 <chr>, mo_358 <chr>, mo_360 <chr>, c_wt <dbl>,
# ch_27 <chr>, ch_28 <chr>, ch_29 <chr>, ch_30 <chr>, c
# ch_32 <chr>, ch_33 <chr>, ch_34 <chr>, ch_35 <chr>, c
# mo_ht <dbl>, mo_bmi <dbl>, hamd_baseline <dbl>, bdq_b
```

```
thp %>%
  filter(attrit2 == 0 & THP_sample ==
```

```
# A tibble: 585 × 394
  newid interviewer    uc grandmother employed_mo income
  <dbl>         <dbl> <dbl> <chr>         <chr>         <d
1    226             1     1 No             No
2      3             1     1 No             No
3   354             1     1 Yes            No
4   225             4     1 No             No
5      2             4     1 Yes            No
6   729             1     1 No             No
7   228             4     1 No             No
8   180             4     1 No             No
9   178             1     1 No             No
10  224             7     1 Yes            No
# i 575 more rows
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# mo_185 <chr>, mo_358 <chr>, mo_360 <chr>, c_wt <dbl>,
# ch_27 <chr>, ch_28 <chr>, ch_29 <chr>, ch_30 <chr>, c
# ch_32 <chr>, ch_33 <chr>, ch_34 <chr>, ch_35 <chr>, c
# mo_ht <dbl>, mo_bmi <dbl>, hamd_baseline <dbl>, bdq_b
```

```
thp %>%
  filter(attrit2 == 0 & THP_sample ==
    group_by(treat)
```

```
# A tibble: 585 × 394
# Groups:   treat [2]
  newid interviewer    uc grandmother employed_mo income
  <dbl>         <dbl> <dbl> <chr>         <chr>         <d
1    226             1     1 No             No
2      3             1     1 No             No
3   354             1     1 Yes            No
4   225             4     1 No             No
5      2             4     1 Yes            No
6   729             1     1 No             No
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# ch_32 <chr>, ch_33 <chr>, ch_34 <chr>, ch_35 <chr>, c
# mo_ht <dbl>, mo_bmi <dbl>, hamd_baseline <dbl>, bdq_b
```

```
thp %>%  
  filter(attrit2 == 0 & THP_sample ==  
  group_by(treat) %>%  
  summarize( dep6m_avg = round(mean(c
```

```
thp %>%
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```
thp
```

```
# A tibble: 1,203 × 394
  newid interviewer    uc grandmother employed_mo income
  <dbl>         <dbl> <dbl> <chr>          <chr>          <d
1      NA             NA     1 <NA>          <NA>
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3     222             6     1 Yes           No
4       3             1     1 No            No
5     217             3     1 No            No
6     354             1     1 Yes           No
7      NA             NA     1 <NA>          <NA>
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# mo_ht <dbl>, mo_bmi <dbl>, hamd_baseline <dbl>, bdq_b
```

```
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  group_by(treat) %>%
  summarize( dep6m_avg = round(mean(c

thp %>%
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```

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  newid interviewer    uc grandmother employed_mo income
  <dbl>         <dbl> <dbl> <chr>         <chr>         <d
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2      3             1     1 No             No
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4    225             4     1 No             No
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# ch_32 <chr>, ch_33 <chr>, ch_34 <chr>, ch_35 <chr>, c
# mo_ht <dbl>, mo_bmi <dbl>, hamd_baseline <dbl>, bdq_b
```



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# Groups:   treat [2]
  newid interviewer    uc grandmother employed_mo income
  <dbl>         <dbl> <dbl> <chr>          <chr>          <d
1     226             1     1 No             No
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4    225             4     1 No             No
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```

```
thp %>%  
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```
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  filter(attrit2 == 0 & THP_sample ==  
  group_by(treat) %>%  
  summarize( depressed_1y = round(mea
```

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thp
```

```
# A tibble: 1,203 × 394
  newid interviewer    uc grandmother employed_mo income
  <dbl>         <dbl> <dbl> <chr>         <chr>         <d
1     NA             NA     1 <NA>         <NA>
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3    222             6     1 Yes          No
4     3             1     1 No           No
5    217             3     1 No           No
6    354             1     1 Yes          No
7     NA             NA     1 <NA>         <NA>
8     NA             NA     1 <NA>         <NA>
9    225             4     1 No           No
10    2             4     1 Yes          No
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# mo_185 <chr>, mo_358 <chr>, mo_360 <chr>, c_wt <dbl>,
# ch_27 <chr>, ch_28 <chr>, ch_29 <chr>, ch_30 <chr>, c
# ch_32 <chr>, ch_33 <chr>, ch_34 <chr>, ch_35 <chr>, c
# mo_ht <dbl>, mo_bmi <dbl>, hamd_baseline <dbl>, bdq_b
```

```
thp %>%
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# ch_27 <chr>, ch_28 <chr>, ch_29 <chr>, ch_30 <chr>, c
# ch_32 <chr>, ch_33 <chr>, ch_34 <chr>, ch_35 <chr>, c
# mo_ht <dbl>, mo_bmi <dbl>, hamd_baseline <dbl>, bdq_b
```

```
thp %>%
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  group_by(treat) %>%
  summarize( depressed_1y = round(mea

thp %>%
  filter(attrit2 == 0 & THP_sample ==
  group_by(treat)
```

```
# A tibble: 585 × 394
# Groups:   treat [2]
  newid interviewer    uc grandmother employed_mo income
  <dbl>         <dbl> <dbl> <chr>          <chr>          <d
1     226             1     1 No             No
2       3             1     1 No             No
3    354             1     1 Yes            No
4    225             4     1 No             No
5       2             4     1 Yes            No
6    729             1     1 No             No
7    228             4     1 No             No
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# i 386 more variables: edu_mo <dbl>, edu_fa <dbl>, ideal
# no_kids_over5_dead <dbl>, no_kids_1_5_dead <dbl>, no_
# mo_185 <chr>, mo_358 <chr>, mo_360 <chr>, c_wt <dbl>,
# ch_27 <chr>, ch_28 <chr>, ch_29 <chr>, ch_30 <chr>, c
# ch_32 <chr>, ch_33 <chr>, ch_34 <chr>, ch_35 <chr>, c
# mo_ht <dbl>, mo_bmi <dbl>, hamd_baseline <dbl>, bdq_b
```

```
thp %>%  
  filter(attrit2 == 0 & THP_sample ==  
  group_by(treat) %>%  
  summarize( dep6m_avg = round(mean(c
```

```
thp %>%  
  filter(attrit2 == 0 & THP_sample ==  
  group_by(treat) %>%  
  summarize( depressed_1y = round(mea
```

```
thp %>%  
  filter(attrit2 == 0 & THP_sample ==  
  group_by(treat) %>%  
  summarize( depressed_avg = round(me
```

```
thp %>%
  filter(attrit2 == 0 & THP_sample ==
  group_by(treat) %>%
  summarize( dep6m_avg = round(mean(c
```

```
thp %>%
  filter(attrit2 == 0 & THP_sample ==
  group_by(treat) %>%
  summarize( depressed_1y = round(mea
```

```
thp %>%
  filter(attrit2 == 0 & THP_sample ==
  group_by(treat) %>%
  summarize( depressed_avg = round(me
```

dep1

```
# A tibble: 2 × 2
  treat dep6m_avg
  <dbl>   <dbl>
1     0     0.522
2     1     0.201
```

```

thp %>%
  filter(attrit2 == 0 & THP_sample ==
group_by(treat) %>%
  summarize( dep6m_avg = round(mean(c

thp %>%
  filter(attrit2 == 0 & THP_sample ==
group_by(treat) %>%
  summarize( depressed_1y = round(mea

thp %>%
  filter(attrit2 == 0 & THP_sample ==
group_by(treat) %>%
  summarize( depressed_avg = round(me

dep1 %>%
  bind_rows(dep2)

```

```

# A tibble: 4 × 3
  treat dep6m_avg depressed_1y
  <dbl>   <dbl>       <dbl>
1     0     0.522         NA
2     1     0.201         NA
3     0     NA           0.583
4     1     NA           0.249

```



```

thp %>%
  filter(attrit2 == 0 & THP_sample ==
  group_by(treat) %>%
  summarize( dep6m_avg = round(mean(c

thp %>%
  filter(attrit2 == 0 & THP_sample ==
  group_by(treat) %>%
  summarize( depressed_1y = round(mea

thp %>%
  filter(attrit2 == 0 & THP_sample ==
  group_by(treat) %>%
  summarize( depressed_avg = round(me

dep1 %>%
  bind_rows(dep2) %>%
  bind_rows(dep3)

```

```

# A tibble: 6 × 4
  treat dep6m_avg depressed_1y depressed_avg
  <dbl>     <dbl>         <dbl>         <dbl>
1     0     0.522           NA             NA
2     1     0.201           NA             NA
3     0     NA             0.583          NA
4     1     NA             0.249          NA
5     0     NA             NA             0.304
6     1     NA             NA             0.239

```

```

thp %>%
  filter(attrit2 == 0 & THP_sample ==
  group_by(treat) %>%
  summarize( dep6m_avg = round(mean(c

thp %>%
  filter(attrit2 == 0 & THP_sample ==
  group_by(treat) %>%
  summarize( depressed_1y = round(mea

thp %>%
  filter(attrit2 == 0 & THP_sample ==
  group_by(treat) %>%
  summarize( depressed_avg = round(me

dep1 %>%
  bind_rows(dep2) %>%
  bind_rows(dep3) %>%
  pivot_longer(cols = -treat, names_t

```

```

# A tibble: 18 × 3
  treat depression      value
  <dbl> <chr>         <dbl>
1      0 dep6m_avg      0.522
2      0 depressed_1y    NA
3      0 depressed_avg  NA
4      1 dep6m_avg      0.201
5      1 depressed_1y    NA
6      1 depressed_avg  NA
7      0 dep6m_avg      NA
8      0 depressed_1y    0.583
9      0 depressed_avg  NA
10     1 dep6m_avg      NA
11     1 depressed_1y    0.249
12     1 depressed_avg  NA
13     0 dep6m_avg      NA
14     0 depressed_1y    NA
15     0 depressed_avg  0.304
16     1 dep6m_avg      NA
17     1 depressed_1y    NA
18     1 depressed_avg  0.239

```

```

thp %>%
  filter(attrit2 == 0 & THP_sample ==
  group_by(treat) %>%
  summarize( dep6m_avg = round(mean(c

thp %>%
  filter(attrit2 == 0 & THP_sample ==
  group_by(treat) %>%
  summarize( depressed_1y = round(mea

thp %>%
  filter(attrit2 == 0 & THP_sample ==
  group_by(treat) %>%
  summarize( depressed_avg = round(me

dep1 %>%
  bind_rows(dep2) %>%
  bind_rows(dep3) %>%
  pivot_longer(cols = -treat, names_t
  filter( !is.na(value) )

```

```

# A tibble: 6 × 3
  treat depression    value
  <dbl> <chr>         <dbl>
1     0 dep6m_avg      0.522
2     1 dep6m_avg      0.201
3     0 depressed_1y    0.583
4     1 depressed_1y    0.249
5     0 depressed_avg  0.304
6     1 depressed_avg  0.239

```

```

thp %>%
  filter(attrit2 == 0 & THP_sample ==
group_by(treat) %>%
  summarize( dep6m_avg = round(mean(c

thp %>%
  filter(attrit2 == 0 & THP_sample ==
group_by(treat) %>%
  summarize( depressed_1y = round(mea

thp %>%
  filter(attrit2 == 0 & THP_sample ==
group_by(treat) %>%
  summarize( depressed_avg = round(me

dep1 %>%
  bind_rows(dep2) %>%
  bind_rows(dep3) %>%
  pivot_longer(cols = -treat, names_t
  filter( !is.na(value) ) %>%
  pivot_wider( names_from = depressic

```

```

# A tibble: 2 × 4
  treat dep6m_avg depressed_1y depressed_avg
  <dbl>     <dbl>         <dbl>         <dbl>
1     0       0.522         0.583         0.304
2     1       0.201         0.249         0.239

```

```

thp %>%
  filter(attrit2 == 0 & THP_sample == 1)
  group_by(treat) %>%
  summarize( dep6m_avg = round(mean(depressed_6m), 3))

thp %>%
  filter(attrit2 == 0 & THP_sample == 1)
  group_by(treat) %>%
  summarize( depressed_1y = round(mean(depressed_1y), 3))

thp %>%
  filter(attrit2 == 0 & THP_sample == 1)
  group_by(treat) %>%
  summarize( depressed_avg = round(mean(depressed_avg), 3))

dep1 %>%
  bind_rows(dep2) %>%
  bind_rows(dep3) %>%
  pivot_longer(cols = -treat, names_to = "timepoint", values_to = "depression")
  filter( !is.na(value) ) %>%
  pivot_wider( names_from = depression, values_from = value )
  kbl(col.names = c("Treatment", "6 Monate", "1 Jahr", "7 Jahre"))

```

**Treatment 6 Monate 1 Jahr 7 Jahre**

|   |       |       |       |
|---|-------|-------|-------|
| 0 | 0.522 | 0.583 | 0.304 |
| 1 | 0.201 | 0.249 | 0.239 |

```

thp %>%
  filter(attrit2 == 0 & THP_sample ==
group_by(treat) %>%
  summarize( dep6m_avg = round(mean(c

thp %>%
  filter(attrit2 == 0 & THP_sample ==
group_by(treat) %>%
  summarize( depressed_1y = round(mea

thp %>%
  filter(attrit2 == 0 & THP_sample ==
group_by(treat) %>%
  summarize( depressed_avg = round(me

dep1 %>%
  bind_rows(dep2) %>%
  bind_rows(dep3) %>%
  pivot_longer(cols = -treat, names_t
  filter( !is.na(value) ) %>%
  pivot_wider( names_from = depressic
  kbl(col.names = c("Treatment", "6 M
kable_styling(bootstrap_options = c

```

**Treatment 6 Monate 1 Jahr 7 Jahre**

|   |       |       |       |
|---|-------|-------|-------|
| 0 | 0.522 | 0.583 | 0.304 |
| 1 | 0.201 | 0.249 | 0.239 |

```

thp %>%
  filter(attrit2 == 0 & THP_sample ==
group_by(treat) %>%
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  summarize( depressed_avg = round(me

dep1 %>%
  bind_rows(dep2) %>%
  bind_rows(dep3) %>%
  pivot_longer(cols = -treat, names_t
  filter( !is.na(value) ) %>%
  pivot_wider( names_from = depressic
  kbl(col.names = c("Treatment", "6 M
  kable_styling(bootstrap_options = c
  kable_paper(full_width = F)

```

| Treatment | 6 Monate | 1 Jahr | 7 Jahre |
|-----------|----------|--------|---------|
| 0         | 0.522    | 0.583  | 0.304   |
| 1         | 0.201    | 0.249  | 0.239   |

```

thp %>%
  filter(attrit2 == 0 & THP_sample ==
group_by(treat) %>%
  summarize( dep6m_avg = round(mean(c

thp %>%
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  pivot_wider( names_from = depressic
  kbl(col.names = c("Treatment", "6 M
  kable_styling(bootstrap_options = c
  kable_paper(full_width = F) %>%
  add_header_above(c(" ", "Anteil an

```

| Treatment | Anteil an Depressionen |        |         |
|-----------|------------------------|--------|---------|
|           | 6 Monate               | 1 Jahr | 7 Jahre |
| 0         | 0.522                  | 0.583  | 0.304   |
| 1         | 0.201                  | 0.249  | 0.239   |



## Schritt 2: Durchschnittliche Differenzen

| Treatment | Anteil an Depressionen |        |         |
|-----------|------------------------|--------|---------|
|           | 6 Monate               | 1 Jahr | 7 Jahre |
| 0         | 0.522                  | 0.583  | 0.304   |
| 1         | 0.201                  | 0.249  | 0.239   |

# Schritt 2: Durchschnittliche Differenzen

```
reg_dep6m <- lm(depressed_6m ~ treat, data = filter(thp, attrit2 == 0 & THP_sample == 1))
reg_dep6m_long <- lm(depressed_6m ~ treat + age_baseline + age_baseline_sq + employed_mo_baseline

reg_dep1y <- lm(depressed_1y ~ treat, data = filter(thp, attrit2 == 0 & THP_sample == 1))
reg_dep1y_long <- lm(depressed_1y ~ treat + age_baseline + age_baseline_sq + employed_mo_baseline

reg_dep7y <- lm(depressed ~ treat, data = filter(thp, attrit2 == 0 & THP_sample == 1))
reg_dep7y_long <- lm(depressed ~ treat + age_baseline + age_baseline_sq + employed_mo_baseline +

rows <- tribble(~term, ~reg_dep6m, ~reg_dep6m_long, ~reg_dep1y, ~reg_dep1y_long, ~reg_c
                "Kontrollvariablen", "Nein", "Ja", "Nein", "Ja", "Nein", "Ja")

attr(rows, 'position') <- c(3)

modelsummary(list(reg_dep6m, reg_dep6m_long, reg_dep1y, reg_dep1y_long, reg_dep7y, reg_dep7y_long
  type = "html",
  covariate.labels = c("Treatment"),
  keep = "treat",
  add_rows = rows,
  fmt = 2,
  statistic = 'conf.int',
  conf_level = .99,
  gof_omit = 'DF|Deviance|RMSE|AIC|BIC|Log.Lik',
  add.lines = list(c("Kontrollvariablen", "Nein", "Ja", "Nein", "Ja", "Nein", "Ja")),
  title = "Depression bei Müttern, mit und ohne Kontrollvariablen") %>%
  add_header_above(c(" " = 1, "Nach 6 Monaten" = 2, "Nach 1 Jahr" = 2, "Nach 7 Jahren" = 2
```

## Schritt 2: Durchschnittliche Differenzen

| Depression bei Müttern, mit und ohne Kontrollvariablen |                |                |                |                |               |               |
|--------------------------------------------------------|----------------|----------------|----------------|----------------|---------------|---------------|
|                                                        | Nach 6 Monaten |                | Nach 1 Jahr    |                | Nach 7 Jahren |               |
|                                                        | (1)            | (2)            | (3)            | (4)            | (5)           | (6)           |
| Treatment                                              | -0.32          | -0.32          | -0.33          | -0.31          | -0.07         | -0.05         |
|                                                        | [-0.42, -0.22] | [-0.42, -0.22] | [-0.43, -0.23] | [-0.41, -0.21] | [-0.16, 0.03] | [-0.14, 0.05] |
| Kontrollvariablen                                      | Nein           | Ja             | Nein           | Ja             | Nein          | Ja            |
| Num.Obs.                                               | 584            | 584            | 584            | 584            | 585           | 585           |
| R2                                                     | 0.112          | 0.221          | 0.115          | 0.230          | 0.005         | 0.165         |
| R2 Adj.                                                | 0.110          | 0.181          | 0.113          | 0.192          | 0.004         | 0.123         |

# GEGENÜBERSTELLUNG DER DURCHSCHNITTlichen DIFFERENZEN

| Treatment | Anteil an Depressionen |        |         |
|-----------|------------------------|--------|---------|
|           | 6 Monate               | 1 Jahr | 7 Jahre |
| 0         | 0.522                  | 0.583  | 0.304   |
| 1         | 0.201                  | 0.249  | 0.239   |

|                   | Depression bei Müttern, mit und ohne Kontrollvariablen |                       |                       |                       |                      |                      |
|-------------------|--------------------------------------------------------|-----------------------|-----------------------|-----------------------|----------------------|----------------------|
|                   | Nach 6 Monaten                                         |                       | Nach 1 Jahr           |                       | Nach 7 Jahren        |                      |
|                   | (1)                                                    | (2)                   | (3)                   | (4)                   | (5)                  | (6)                  |
| Treatment         | -0.32                                                  | -0.32                 | -0.33                 | -0.31                 | -0.07                | -0.05                |
|                   | <u>[-0.42, -0.22]</u>                                  | <u>[-0.42, -0.22]</u> | <u>[-0.43, -0.23]</u> | <u>[-0.41, -0.21]</u> | <u>[-0.16, 0.03]</u> | <u>[-0.14, 0.05]</u> |
| Kontrollvariablen | Nein                                                   | Ja                    | Nein                  | Ja                    | Nein                 | Ja                   |
| Num.Obs.          | 584                                                    | 584                   | 584                   | 584                   | 585                  | 585                  |
| R2                | 0.112                                                  | 0.221                 | 0.115                 | 0.230                 | 0.005                | 0.165                |
| R2 Adj.           | 0.110                                                  | 0.181                 | 0.113                 | 0.192                 | 0.004                | 0.123                |

# Schritt 2: Durchschnittliche Differenzen

Sollten wir für irgendwelche Variablen kontrollieren?

# Schritt 2: Durchschnittliche Differenzen

Sollten wir für irgendwelche Variablen kontrollieren?

Nein, wir sollten für nichts kontrollieren!

Alle Pfeile in das Treatment wurden im DAG gelöscht, daher gibt es auch theoretisch keine Confounder auf die wir kontrollieren müssten.

# Schritt 2: Durchschnittliche Differenzen

count: false

```
reg_financial <- lm(motherfinancial ~
```

```
reg_financial <- lm(motherfinancial ~  
reg_money <- lm(parentmoney ~ treat,
```



```
reg_financial <- lm(motherfinancial ~  
reg_money <- lm(parentmoney ~ treat,  
reg_time<- lm(parenttime ~ treat, dat
```

```
reg_financial <- lm(motherfinancial ~  
reg_money <- lm(parentmoney ~ treat,  
reg_time<- lm(parenttime ~ treat, dat  
reg_style <- lm(parentstyle ~ treat,
```

```
reg_financial <- lm(motherfinancial ~  
reg_money <- lm(parentmoney ~ treat,  
reg_time<- lm(parenttime ~ treat, dat  
reg_style <- lm(parentstyle ~ treat,  
reg_fertility <- lm(fertility_vars ~
```

```
reg_financial <- lm(motherfinancial ~  
reg_money <- lm(parentmoney ~ treat,  
reg_time<- lm(parenttime ~ treat, dat  
reg_style <- lm(parentstyle ~ treat,  
reg_fertility <- lm(fertility_vars ~
```

```
tidy(reg_financial, conf.int = T)
```

```
# A tibble: 2 × 7  
  term                estimate std.error statistic    p.val  
  <chr>              <dbl>    <dbl>    <dbl>    <dbl>  
1 (Intercept) 0.00000000741 0.0593 0.000000125 1.00  
2 treat      0.341      0.0843 4.04      0.00006
```

```
reg_financial <- lm(motherfinancial ~
reg_money <- lm(parentmoney ~ treat,
reg_time<- lm(parenttime ~ treat, dat
reg_style <- lm(parentstyle ~ treat,
reg_fertility <- lm(fertility_vars ~
```

```
tidy(reg_financial, conf.int = T) %>%
  mutate(term = ifelse( term == "trea
```

```
# A tibble: 2 × 7
  term                estimate std.error  statistic    p.val
  <chr>              <dbl>    <dbl>    <dbl>    <dbl>
1 (Intercept) 0.00000000741 0.0593 0.000000125 1.00
2 fin_emp      0.341      0.0843 4.04      0.00006
```

```
reg_financial <- lm(motherfinancial ~
reg_money <- lm(parentmoney ~ treat,
reg_time<- lm(parenttime ~ treat, dat
reg_style <- lm(parentstyle ~ treat,
reg_fertility <- lm(fertility_vars ~

tidy(reg_financial, conf.int = T) %>%
  mutate(term = ifelse( term == "trea
bind_rows(tidy(reg_money, conf.int
```

```
# A tibble: 4 × 7
  term          estimate std.error statistic    p.value c
  <chr>          <dbl>    <dbl>    <dbl>    <dbl>
1 (Intercept) 7.41e- 9    0.0593 0.000000125 1.00
2 fin_emp     3.41e- 1    0.0843 4.04      0.0000608
3 (Intercept) 8.03e-10    0.0580 0.0000000138 1.00
4 treat       3.57e- 1    0.0825 4.33      0.0000173
```

```
reg_financial <- lm(motherfinancial ~
reg_money <- lm(parentmoney ~ treat,
reg_time<- lm(parenttime ~ treat, dat
reg_style <- lm(parentstyle ~ treat,
reg_fertility <- lm(fertility_vars ~

tidy(reg_financial, conf.int = T) %>%
  mutate(term = ifelse( term == "trea
  bind_rows(tidy(reg_money, conf.int
  mutate(term = ifelse( term == "trea
```

```
# A tibble: 4 × 7
  term          estimate std.error statistic    p.value c
  <chr>          <dbl>    <dbl>    <dbl>    <dbl> <dbl>
1 (Intercept)  7.41e- 9    0.0593 0.000000125 1.00
2 fin_emp      3.41e- 1    0.0843 4.04        0.0000608
3 (Intercept)  8.03e-10    0.0580 0.0000000138 1.00
4 money        3.57e- 1    0.0825 4.33        0.0000173
```

```

reg_financial <- lm(motherfinancial ~
reg_money <- lm(parentmoney ~ treat,
reg_time<- lm(parenttime ~ treat, dat
reg_style <- lm(parentstyle ~ treat,
reg_fertility <- lm(fertility_vars ~

tidy(reg_financial, conf.int = T) %>%
  mutate(term = ifelse( term == "trea
  bind_rows(tidy(reg_money, conf.int
  mutate(term = ifelse( term == "trea
  bind_rows(tidy(reg_time, conf.int =

```

```

# A tibble: 6 × 7
  term          estimate std.error statistic    p.value con
  <chr>          <dbl>    <dbl>    <dbl>    <dbl>   <dbl>
1 (Intercept)  7.41e- 9    0.0593  1.25e- 7  1.00    -
2 fin_emp      3.41e- 1    0.0843  4.04e+ 0  0.0000608
3 (Intercept)  8.03e-10    0.0580  1.38e- 8  1.00    -
4 money        3.57e- 1    0.0825  4.33e+ 0  0.0000173
5 (Intercept) -1.35e-11    0.0566 -2.39e-10  1.00    -
6 treat        3.19e- 1    0.0805  3.96e+ 0  0.0000847

```



```

reg_financial <- lm(motherfinancial ~
reg_money <- lm(parentmoney ~ treat,
reg_time<- lm(parenttime ~ treat, dat
reg_style <- lm(parentstyle ~ treat,
reg_fertility <- lm(fertility_vars ~

tidy(reg_financial, conf.int = T) %>%
  mutate(term = ifelse( term == "trea
  bind_rows(tidy(reg_money, conf.int
  mutate(term = ifelse( term == "trea
  bind_rows(tidy(reg_time, conf.int =
  mutate(term = ifelse( term == "trea

```

```

# A tibble: 6 × 7
  term          estimate std.error statistic    p.value con
  <chr>          <dbl>    <dbl>    <dbl>    <dbl>   <dbl>
1 (Intercept)  7.41e- 9    0.0593  1.25e- 7  1.00    -
2 fin_emp      3.41e- 1    0.0843  4.04e+ 0  0.0000608
3 (Intercept)  8.03e-10    0.0580  1.38e- 8  1.00    -
4 money        3.57e- 1    0.0825  4.33e+ 0  0.0000173
5 (Intercept) -1.35e-11    0.0566 -2.39e-10  1.00    -
6 time         3.19e- 1    0.0805  3.96e+ 0  0.0000847

```

```
reg_financial <- lm(motherfinancial ~
reg_money <- lm(parentmoney ~ treat,
reg_time<- lm(parenttime ~ treat, dat
reg_style <- lm(parentstyle ~ treat,
reg_fertility <- lm(fertility_vars ~

tidy(reg_financial, conf.int = T) %>%
  mutate(term = ifelse( term == "trea
  bind_rows(tidy(reg_money, conf.int
  mutate(term = ifelse( term == "trea
  bind_rows(tidy(reg_time, conf.int =
  mutate(term = ifelse( term == "trea
  bind_rows(tidy(reg_style, conf.int
```

```
# A tibble: 8 × 7
  term          estimate std.error statistic    p.value con
<chr>          <dbl>      <dbl>      <dbl>    <dbl>   <dbl>
1 (Intercept)  7.41e- 9      0.0593    1.25e- 7 1.00     -0
2 fin_emp      3.41e- 1      0.0843    4.04e+ 0 0.0000608 0
3 (Intercept)  8.03e-10      0.0580    1.38e- 8 1.00     -0
4 money        3.57e- 1      0.0825    4.33e+ 0 0.0000173 0
5 (Intercept) -1.35e-11      0.0566   -2.39e-10 1.00     -0
6 time         3.19e- 1      0.0805    3.96e+ 0 0.0000847 0
7 (Intercept) -1.69e- 9      0.0577   -2.94e- 8 1.00     -0
8 treat        6.31e- 2      0.0820    7.69e- 1 0.442     -0
```

```

reg_financial <- lm(motherfinancial ~
reg_money <- lm(parentmoney ~ treat,
reg_time<- lm(parenttime ~ treat, dat
reg_style <- lm(parentstyle ~ treat,
reg_fertility <- lm(fertility_vars ~

tidy(reg_financial, conf.int = T) %>%
  mutate(term = ifelse( term == "trea
  bind_rows(tidy(reg_money, conf.int
  mutate(term = ifelse( term == "trea
  bind_rows(tidy(reg_time, conf.int =
  mutate(term = ifelse( term == "trea
  bind_rows(tidy(reg_style, conf.int
  mutate(term = ifelse( term == "trea

```

```

# A tibble: 8 × 7
  term          estimate std.error statistic    p.value con
  <chr>          <dbl>    <dbl>    <dbl>    <dbl>    <dbl>
1 (Intercept)  7.41e- 9    0.0593  1.25e- 7 1.00      -0
2 fin_emp      3.41e- 1    0.0843  4.04e+ 0 0.0000608 0
3 (Intercept)  8.03e-10    0.0580  1.38e- 8 1.00      -0
4 money        3.57e- 1    0.0825  4.33e+ 0 0.0000173 0
5 (Intercept) -1.35e-11    0.0566 -2.39e-10 1.00      -0
6 time         3.19e- 1    0.0805  3.96e+ 0 0.0000847 0
7 (Intercept) -1.69e- 9    0.0577 -2.94e- 8 1.00      -0
8 style        6.31e- 2    0.0820  7.69e- 1 0.442     -0

```

```

reg_financial <- lm(motherfinancial ~
reg_money <- lm(parentmoney ~ treat,
reg_time<- lm(parenttime ~ treat, dat
reg_style <- lm(parentstyle ~ treat,
reg_fertility <- lm(fertility_vars ~

tidy(reg_financial, conf.int = T) %>%
  mutate(term = ifelse( term == "trea
  bind_rows(tidy(reg_money, conf.int
  mutate(term = ifelse( term == "trea
  bind_rows(tidy(reg_time, conf.int =
  mutate(term = ifelse( term == "trea
  bind_rows(tidy(reg_style, conf.int
  mutate(term = ifelse( term == "trea
  bind_rows(tidy(reg_fertility, conf.

```

```

# A tibble: 10 × 7
  term          estimate std.error statistic    p.value co
  <chr>          <dbl>    <dbl>    <dbl>    <dbl>    co
1 (Intercept)  7.41e- 9    0.0593  1.25e- 7  1.00      -
2 fin_emp      3.41e- 1    0.0843  4.04e+ 0  0.0000608 -
3 (Intercept)  8.03e-10    0.0580  1.38e- 8  1.00      -
4 money        3.57e- 1    0.0825  4.33e+ 0  0.0000173 -
5 (Intercept) -1.35e-11    0.0566 -2.39e-10  1.00      -
6 time         3.19e- 1    0.0805  3.96e+ 0  0.0000847 -
7 (Intercept) -1.69e- 9    0.0577 -2.94e- 8  1.00      -
8 style        6.31e- 2    0.0820  7.69e- 1  0.442     -
9 (Intercept) -2.40e- 9    0.0584 -4.11e- 8  1.00      -
10 treat       1.67e- 2    0.0831  2.00e- 1  0.841     -

```

```

reg_financial <- lm(motherfinancial ~
reg_money <- lm(parentmoney ~ treat,
reg_time<- lm(parenttime ~ treat, dat
reg_style <- lm(parentstyle ~ treat,
reg_fertility <- lm(fertility_vars ~

tidy(reg_financial, conf.int = T) %>%
  mutate(term = ifelse( term == "trea
  bind_rows(tidy(reg_money, conf.int
  mutate(term = ifelse( term == "trea
  bind_rows(tidy(reg_time, conf.int =
  mutate(term = ifelse( term == "trea
  bind_rows(tidy(reg_style, conf.int
  mutate(term = ifelse( term == "trea
  bind_rows(tidy(reg_fertility, conf.
  mutate(term = ifelse( term == "trea

```

```

# A tibble: 10 × 7
  term          estimate std.error statistic    p.value co
  <chr>          <dbl>    <dbl>    <dbl>    <dbl>    co
1 (Intercept)  7.41e- 9    0.0593  1.25e- 7  1.00      -
2 fin_emp      3.41e- 1    0.0843  4.04e+ 0  0.0000608 -
3 (Intercept)  8.03e-10    0.0580  1.38e- 8  1.00      -
4 money        3.57e- 1    0.0825  4.33e+ 0  0.0000173 -
5 (Intercept) -1.35e-11    0.0566 -2.39e-10  1.00      -
6 time         3.19e- 1    0.0805  3.96e+ 0  0.0000847 -
7 (Intercept) -1.69e- 9    0.0577 -2.94e- 8  1.00      -
8 style        6.31e- 2    0.0820  7.69e- 1  0.442     -
9 (Intercept) -2.40e- 9    0.0584 -4.11e- 8  1.00      -
10 fertility   1.67e- 2    0.0831  2.00e- 1  0.841     -

```

```

reg_financial <- lm(motherfinancial ~
reg_money <- lm(parentmoney ~ treat,
reg_time<- lm(parenttime ~ treat, dat
reg_style <- lm(parentstyle ~ treat,
reg_fertility <- lm(fertility_vars ~

tidy(reg_financial, conf.int = T) %>%
  mutate(term = ifelse( term == "trea
  bind_rows(tidy(reg_money, conf.int
  mutate(term = ifelse( term == "trea
  bind_rows(tidy(reg_time, conf.int =
  mutate(term = ifelse( term == "trea
  bind_rows(tidy(reg_style, conf.int
  mutate(term = ifelse( term == "trea
  bind_rows(tidy(reg_fertility, conf.
  mutate(term = ifelse( term == "trea
  filter( term != "(Intercept)")

```

```

# A tibble: 5 × 7
  term      estimate std.error statistic  p.value conf.l
<chr>      <dbl>      <dbl>      <dbl>    <dbl>    <dbl>
1 fin_emp    0.341        0.0843      4.04 0.0000608  0.17
2 money      0.357        0.0825      4.33 0.0000173  0.19
3 time       0.319        0.0805      3.96 0.0000847  0.16
4 style      0.0631       0.0820      0.769 0.442     -0.09
5 fertility  0.0167        0.0831      0.200 0.841     -0.14

```

```

reg_financial <- lm(motherfinancial ~
reg_money <- lm(parentmoney ~ treat,
reg_time<- lm(parenttime ~ treat, dat
reg_style <- lm(parentstyle ~ treat,
reg_fertility <- lm(fertility_vars ~

tidy(reg_financial, conf.int = T) %>%
  mutate(term = ifelse( term == "trea
  bind_rows(tidy(reg_money, conf.int
  mutate(term = ifelse( term == "trea
  bind_rows(tidy(reg_time, conf.int =
  mutate(term = ifelse( term == "trea
  bind_rows(tidy(reg_style, conf.int
  mutate(term = ifelse( term == "trea
  bind_rows(tidy(reg_fertility, conf.
  mutate(term = ifelse( term == "trea
  filter( term != "(Intercept)") %>%
    mutate(term = fct_relevel(term, "
      term = fct_recode(term,
        "Finanziel
        "Monetäre
        "Zeitliche
        "Erziehung
        "Fruchtbar

```

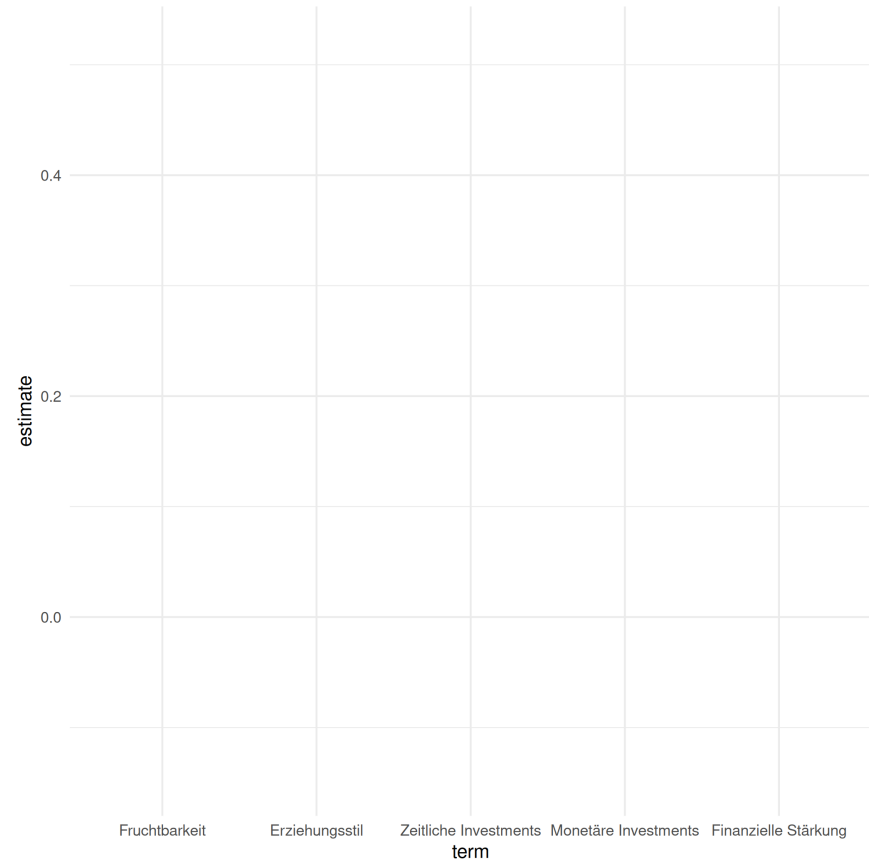
```

# A tibble: 5 × 7
  term                estimate std.error statistic p.v
  <fct>              <dbl>      <dbl>      <dbl>    <
1 Finanzielle Stärkung 0.341      0.0843      4.04    6.0
2 Monetäre Investments 0.357      0.0825      4.33    1.7
3 Zeitliche Investments 0.319      0.0805      3.96    8.4
4 Erziehungsstil       0.0631     0.0820      0.769   4.4
5 Fruchtbarkeit        0.0167     0.0831      0.200   8.4

```

```
reg_financial <- lm(motherfinancial ~
reg_money <- lm(parentmoney ~ treat,
reg_time<- lm(parenttime ~ treat, dat
reg_style <- lm(parentstyle ~ treat,
reg_fertility <- lm(fertility_vars ~
```

```
tidy(reg_financial, conf.int = T) %>%
  mutate(term = ifelse( term == "trea
  bind_rows(tidy(reg_money, conf.int
  mutate(term = ifelse( term == "trea
  bind_rows(tidy(reg_time, conf.int =
  mutate(term = ifelse( term == "trea
  bind_rows(tidy(reg_style, conf.int
  mutate(term = ifelse( term == "trea
  bind_rows(tidy(reg_fertility, conf.
  mutate(term = ifelse( term == "trea
  filter( term != "(Intercept)") %>%
    mutate(term = fct_relevel(term, "
      term = fct_recode(term,
        "Finanziel
        "Monetäre
        "Zeitliche
        "Erziehung
        "Fruchtbar
ggplot(aes(x = term, y=estimate, yr
```





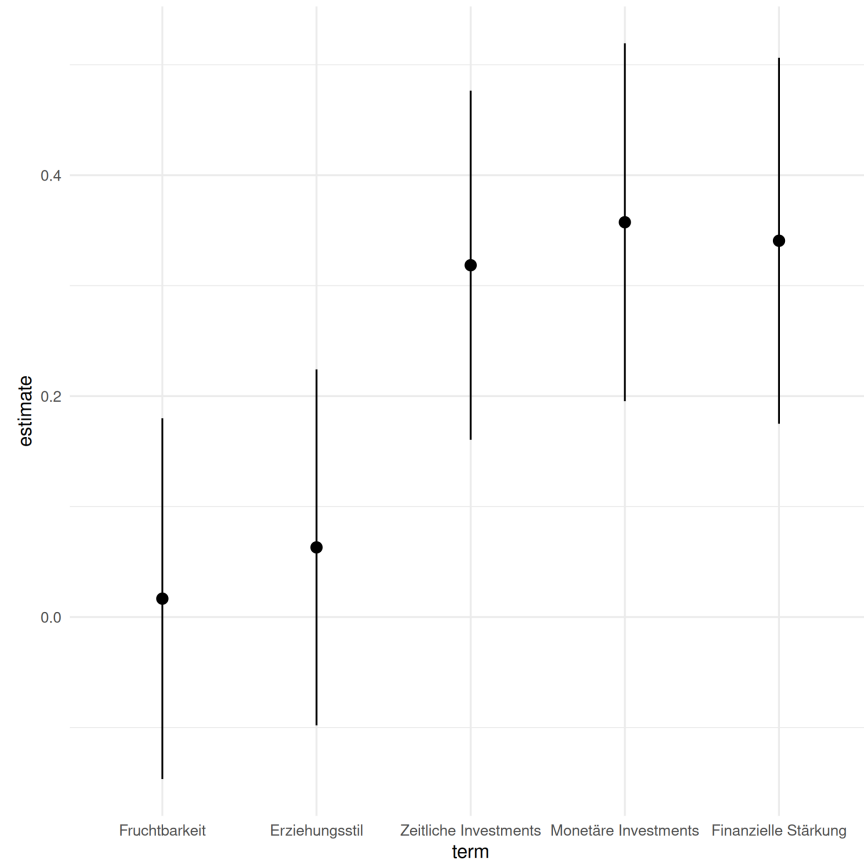
```

reg_financial <- lm(motherfinancial ~
reg_money <- lm(parentmoney ~ treat,
reg_time<- lm(parenttime ~ treat, dat
reg_style <- lm(parentstyle ~ treat,
reg_fertility <- lm(fertility_vars ~

tidy(reg_financial, conf.int = T) %>%
  mutate(term = ifelse( term == "trea
  bind_rows(tidy(reg_money, conf.int
  mutate(term = ifelse( term == "trea
  bind_rows(tidy(reg_time, conf.int =
  mutate(term = ifelse( term == "trea
  bind_rows(tidy(reg_style, conf.int
  mutate(term = ifelse( term == "trea
  bind_rows(tidy(reg_fertility, conf.
  mutate(term = ifelse( term == "trea
  filter( term != "(Intercept)") %>%
    mutate(term = fct_relevel(term, "
      term = fct_recode(term,
        "Finanziel
        "Monetäre
        "Zeitliche
        "Erziehung
        "Fruchtbar

ggplot(aes(x = term, y=estimate, yr
geom_pointrange()

```



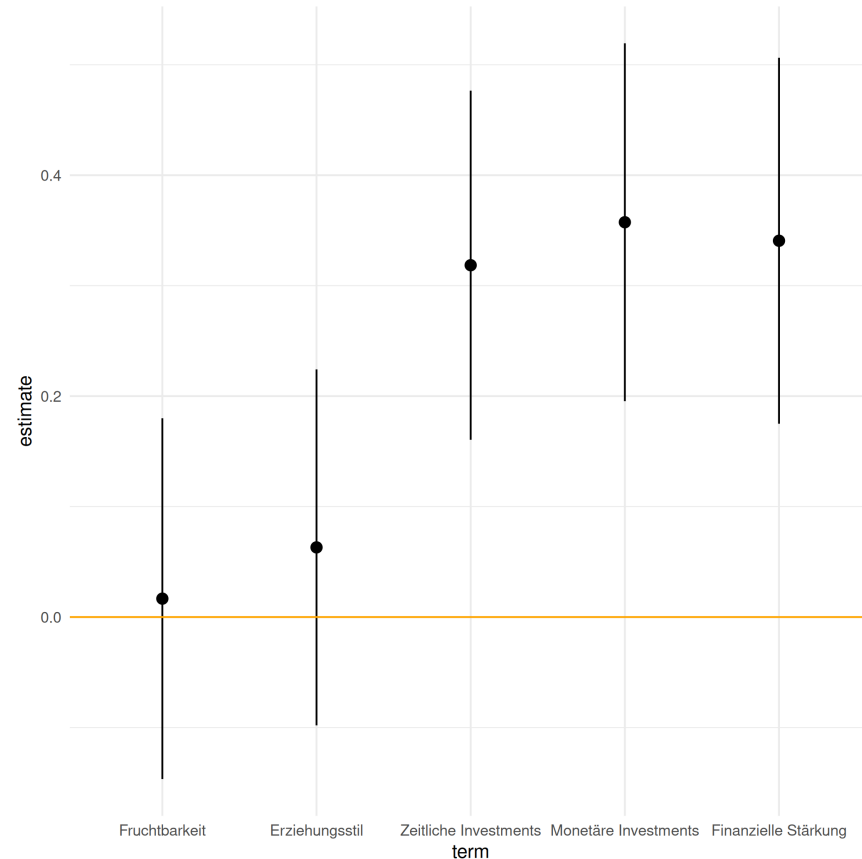
```

reg_financial <- lm(motherfinancial ~
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reg_style <- lm(parentstyle ~ treat,
reg_fertility <- lm(fertility_vars ~

tidy(reg_financial, conf.int = T) %>%
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  bind_rows(tidy(reg_fertility, conf.
  mutate(term = ifelse( term == "trea
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    mutate(term = fct_relevel(term, "
      term = fct_recode(term,
        "Finanziel
        "Monetäre
        "Zeitliche
        "Erziehung
        "Fruchtbar

ggplot(aes(x = term, y=estimate, yr
  geom_pointrange() +
  geom_hline(yintercept = 0, col = "c

```



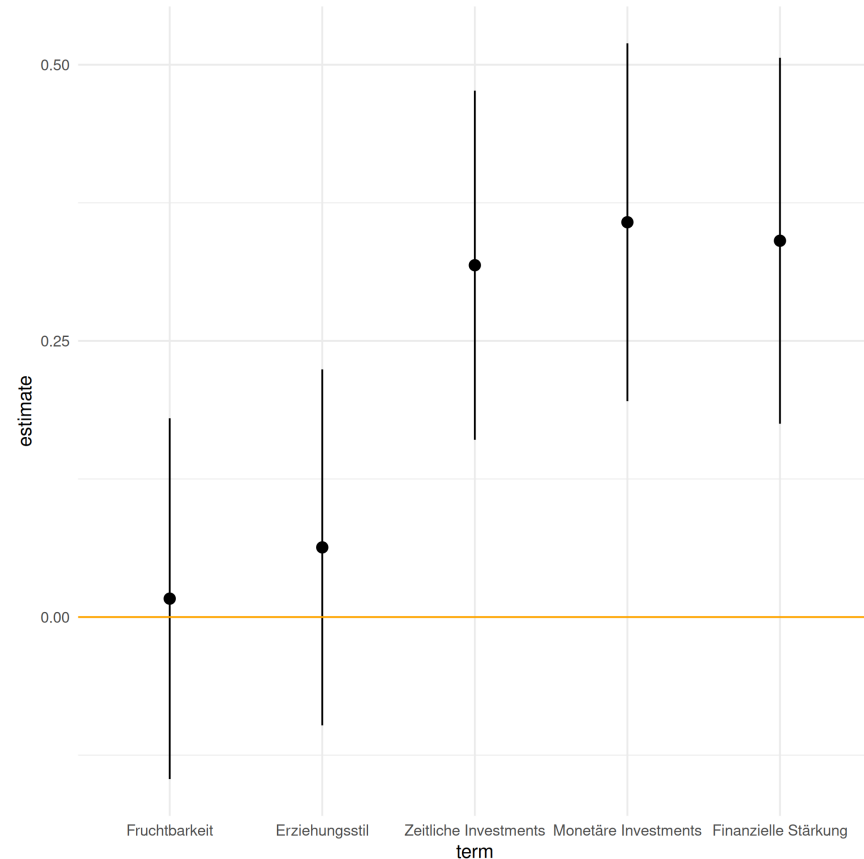
```

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  geom_pointrange() +
  geom_hline(yintercept = 0, col = "c
  scale_y_continuous(breaks = c(-0.25

```



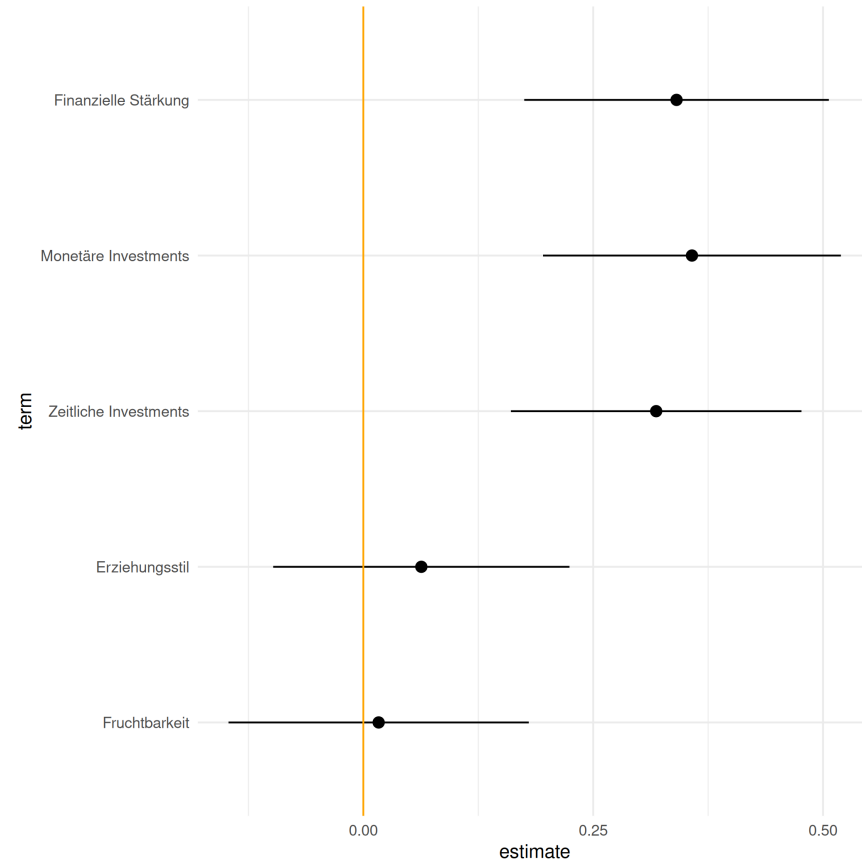
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ggplot(aes(x = term, y=estimate, ym
geom_pointrange() +
geom_hline(yintercept = 0, col = "c
scale_y_continuous(breaks = c(-0.25
coord_flip()

```



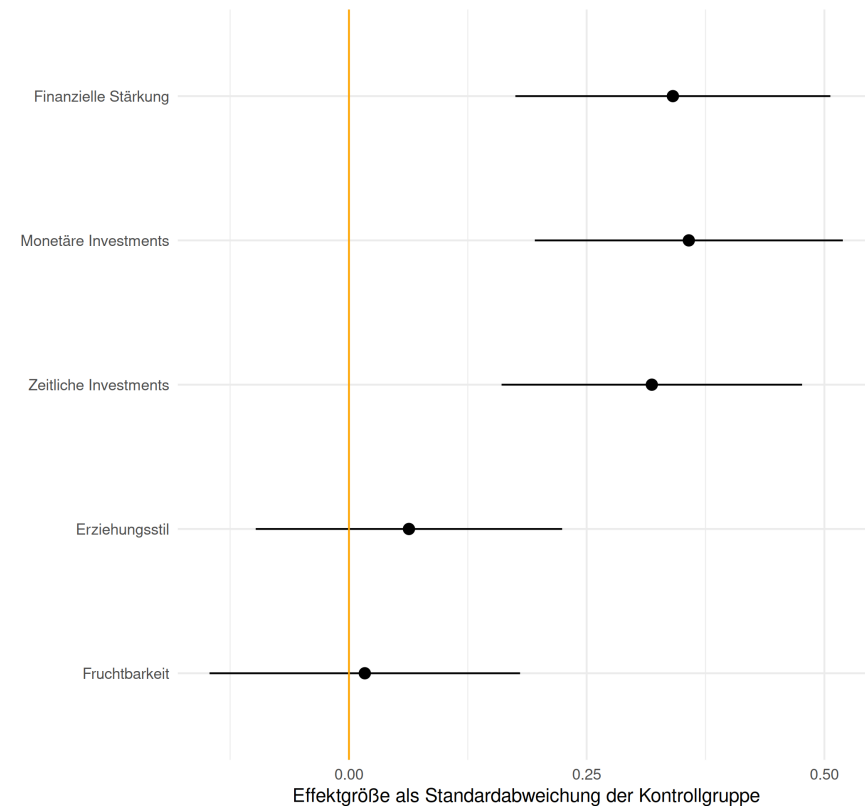
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scale_y_continuous(breaks = c(-0.25
coord_flip() +
```

```
labs(
  x = NULL, y = "Effektgröße als St
  title = "Effekt der Intervention
  subtitle = "95% Konfidenzinterval
)
```

Effekt der Intervention auf ökonomische Entscheidungen der Mutter  
95% Konfidenzintervall um den Punktschätzer

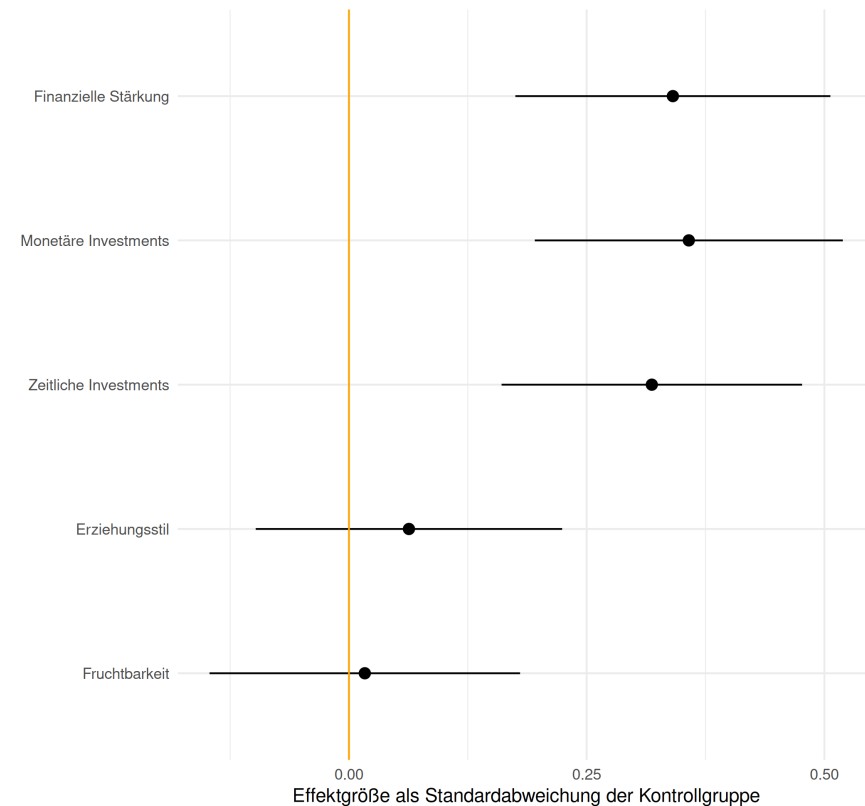


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reg_financial <- lm(motherfinancial ~
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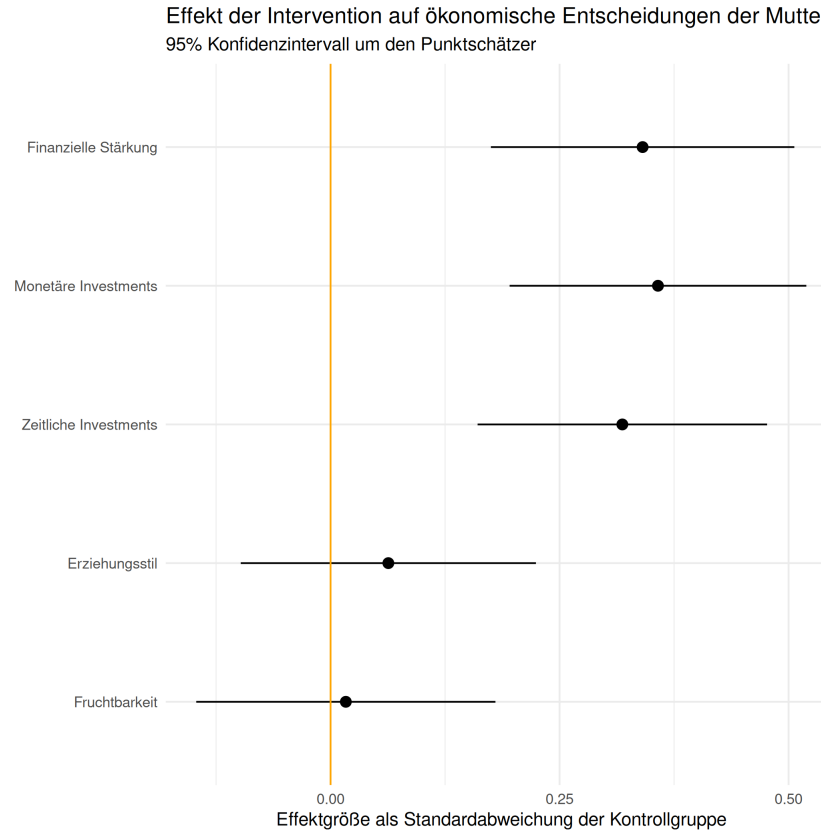
```
tidy(reg_financial, conf.int = T) %>%
  mutate(term = ifelse( term == "trea
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```

Effekt der Intervention auf ökonomische Entscheidungen der Mutter  
95% Konfidenzintervall um den Punktschätzer



# Schritt 2: Durchschnittliche Differenzen



# Experimente als "Goldstandard"?

Oft werden Experimente als "Goldstandard" für die kausale Inferenz betrachtet.



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Doch Experimente sind meist sehr schwer durchzuführen und in manchen Situationen gar nicht denkbar!

Was uns interessiert sind kausale Effekte zu messen und dafür sind Experimente eine wichtige Säule, aber nicht die einzige Möglichkeit!

# Experimente und interne Validität

Experimente können sehr viele Probleme bzgl. interner Validität lösen

- + Selektion
  - + Treatment und Kontrollgruppen sind vergleichbar
  - + Keine Selbstselektion
- + Trends
  - + Keine Saisonalität
  - + Keine Regression zur Mitte

# Experimente und interne Validität

**Jedoch:** Experimente können nicht das Problem der *Attrition* beheben!

Wenn Attrition mit dem Treatment korreliert ist haben wir ein Problem

Genauer: Wenn Personen selektiv aufhören an der Studie teilzunehmen, in Abhängigkeit davon ob sie getreatet wurden oder nicht, dann hilft uns auch ein sehr schön designtes Experiment nicht weiter.

# Experimente und interne Validität

Für unser Experiment:

- ✚ Nach 7 Jahren hatten die Autoren noch eine Befragung der Frauen durchgeführt
- ✚ Wenn die Attrition in der Treatment und Kontrollgruppen über diese 7 Jahre hinweg unterschiedlich war und nun z.B. doppelt so viele Frauen aus der Kontrollgruppe in der Stichprobe sind, dann wäre die Attrition mit dem Treatment Status korreliert und unsere Aussagen nicht mehr valide

# Experimente und interne Validität

Balancing Tabelle für die Grundcharakteristika

Stichprobe Baseline (N = 585)

|                    | Treatment | Kontrolle | Differenz | p-Wert |
|--------------------|-----------|-----------|-----------|--------|
| Stiefoma im Haus   | 0.48      | 0.39      | 0.09      | 0.04   |
| Alter der Mutter   | 26.71     | 27.03     | -0.32     | 0.44   |
| Depressiv (1 Jahr) | 0.25      | 0.58      | -0.33     | 0.00   |
| Bildung des Vaters | 6.98      | 7.20      | -0.22     | 0.48   |
| Vater beschäftigt  | 0.90      | 0.90      | 0.00      | 0.88   |
| Mutter beschäftigt | 0.01      | 0.02      | -0.01     | 0.38   |
| Erstes Kind        | 0.18      | 0.17      | 0.01      | 0.65   |
| Anzahl der Kinder  | 2.08      | 2.42      | -0.34     | 0.02   |
| Oma im Haus        | 0.08      | 0.05      | 0.03      | 0.11   |

*Note:*

Diese Tabelle testet, wie ausbalanciert die Beobachtungen in der Stichprobe nach 7 Jahren sind. In den ersten beiden

# Experimente und interne Validität

Es ist wichtig auf Attrition zu achten:

- + Versuchen Sie so viele Charakteristika über ihre Teilnehmer zu bekommen wie möglich
- + Untersuchen Sie anhand dieser Charakteristika ob die Attrition zwischen den zwei Gruppen zufällig war
- + Versuchen Sie das Commitment ihrer Teilnehmer am Experiment so hoch wie möglich zu halten

Ein weiteres Problem des Experiments könnte sein, das die Teilnehmer sich nicht an das halten, was sie vorgeben:

- + Manche Teilnehmer der Treatment Gruppe werden das Treatment einfach nicht nehmen
- + Manche Teilnehmer der Kontrollgruppe werden eventuell doch an das Treatment kommen