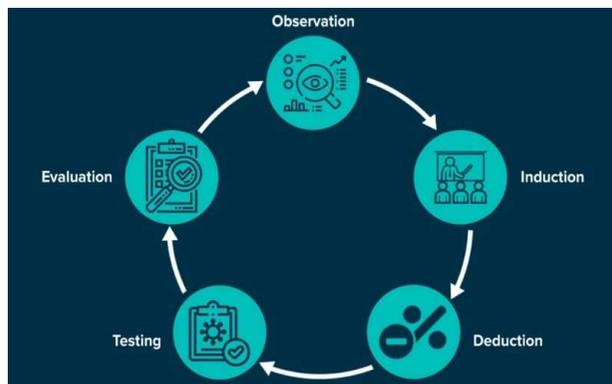


Empirical research in management and economics

Exercise

Thorsten Pachur, Linus Hof, Rebecca West,
Sebastian Hellmann, Nuno Busch

*Technical University of Munich
School of Management
Chair of Behavioral Research Methods*



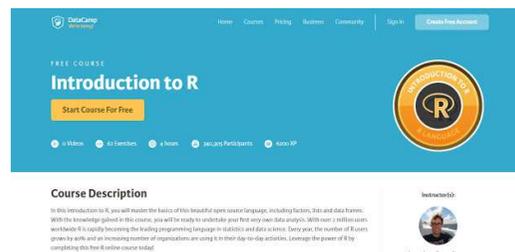
Statistical software



- If you don't know R yet, you can make yourself familiar with it

→ Free tutorials and help files

- <http://www.r-tutor.com/r-introduction>
- <https://cran.r-project.org/doc/contrib/Torfs+Brauer-Short-R-Intro.pdf>
- You can take the free DataCamp online tutorial!
(<https://www.datacamp.com/courses/free-introduction-to-r>)



Script

- Edit and save collections of commands
- View data sets

Workspace

- Import a dataset
- See which variables are in memory

Console/ command window

- Commands and results

Plots/Packages/Help/Viewer/Presentation

- View plots
- Search for packages
- Help function

The screenshot shows the RStudio interface with the following components visible:

- Script Editor:** A text editor window titled 'Untitled1' with a line number '1' and a cursor.
- Environment:** A panel showing 'Global Environment' with 'Environment is empty'.
- Console:** A terminal window showing the R startup message, including version 4.1.1, copyright information, and workspace loading details.
- Plots/Packages/Help/Viewer/Presentation:** A panel with tabs for 'Files', 'Plots', 'Packages', 'Help', 'Viewer', and 'Presentation'.

Exercise



- Get together in groups of 2-3
- Choose a domain for conducting a conjoint analysis
- Identify relevant attributes and attribute levels (based on the criteria for attribute (level) selection discussed in the lecture) for that domain
- Open “Conjoint analysis_Exercise.R” script
- Use the `caFactorialDesign()` function of the *conjoint* package to create the stimuli for running the conjoint analysis. Create both the full and a fractional orthogonal design
- How many stimuli do you get?
- How would you collect preference data for the stimuli?

RStudio

File Edit Code View Plots Session Build Debug Profile Tools Help

Go to file/function Addins Project: (None)

```
1 # Conjoint measurement analysis
2
3 # Install the "conjoint" package
4 install.packages("conjoint")
5 library(conjoint)
6
7 # The following example illustrates how to generate a) the full and b) a fractional (i.e., reduced) design of objects
8
9 # Generate profiles for ICE CREAMS (here with 4 attributes; there are 3 attribute levels for Flavor and Price and 2 at
10 Flavor <- c("Chocolate", "Vanilla", "Strawberry")
11 Price <- c("1.50 EUR", "2.00 EUR", "2.50 EUR")
12 Container <- c("Cone", "Cup")
13 Topping <- c("Yes", "No")
14
15 experiment <- expand.grid(
16   Flavor= Flavor,
17   Price = Price,
18   Container = Container,
19   Topping = Topping
20 )
21
22 levelnames <- c(Flavor,Price,Container,Topping)
23
24 # Generate the full design with the caFactorialDesign() function of the "conjoint" package
25 design.full <- caFactorialDesign(data = experiment,
26                                type = "full",
27                                seed = "123")
28
29 # Generate an orthogonal design with the caFactorialDesign() function of the "conjoint" package
30 design.fractional <- caFactorialDesign(data = experiment,
31                                       type = "orthogonal",
32                                       seed = "123")
33
34
```

Environment

R Global Environment

Environment is empty

Files Plots

Zoom

5:1 (Top Level) R Script

Console Terminal Background Jobs

R 4.2.2: ~/Work/TUM/Teaching/WS22/Empirical_Research/

type 'license()' or 'licence()' for distribution details.

R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

RStudio

File Edit Code View Plots Session Build Debug Profile Tools Help

Go to file/function

Project: (None)

Environment History Connections Tutorial

Import Dataset 222 MIB

R Global Environment

Data

Object	Size	Details
design.full	36 obs. of 4 variables	
experiment	36 obs. of 4 variables	

Values

Variable	Type	Values
Container	chr [1:2]	"Cone" "Cup"
Flavor	chr [1:3]	"chocolate" "vanilla" ...
levelnames	chr [1:10]	"chocolate" "vanilla" ...
Price	chr [1:3]	"1.50 EUR" "2.00 EUR" ...
Topping	chr [1:2]	"Yes" "No"

	Flavor	Price	Container	Topping
1	Chocolate	1.50 EUR	Cone	Yes
2	Vanilla	1.50 EUR	Cone	Yes
3	Strawberry	1.50 EUR	Cone	Yes
4	Chocolate	2.00 EUR	Cone	Yes
5	Vanilla	2.00 EUR	Cone	Yes
6	Strawberry	2.00 EUR	Cone	Yes
7	Chocolate	2.50 EUR	Cone	Yes
8	Vanilla	2.50 EUR	Cone	Yes
9	Strawberry	2.50 EUR	Cone	Yes
10	Chocolate	1.50 EUR	Cup	Yes
11	Vanilla	1.50 EUR	Cup	Yes
12	Strawberry	1.50 EUR	Cup	Yes
13	Chocolate	2.00 EUR	Cup	Yes
14	Vanilla	2.00 EUR	Cup	Yes
15	Strawberry	2.00 EUR	Cup	Yes
16	Chocolate	2.50 EUR	Cup	Yes
17	Vanilla	2.50 EUR	Cup	Yes
18	Strawberry	2.50 EUR	Cup	Yes
19	Chocolate	1.50 EUR	Cone	No
20	Vanilla	1.50 EUR	Cone	No
21	Strawberry	1.50 EUR	Cone	No
22	Chocolate	2.00 EUR	Cone	No

Showing 1 to 22 of 36 entries, 4 total columns

Console Terminal Background Jobs

```
R 4.2.2 . ~/Work/TUM/Teaching/WS22/Empirical Research/
>
> levelnames <- c(Flavor,Price,Container,Topping)
> design.full <- caFactorialDesign(data = experiment,
+                                 type = "full",
+                                 seed = "123")
> view(design.full)
> view(design.full)
> |
```

Files Plots Packages Help Viewer Presentation

Zoom Export

RStudio

File Edit Code View Plots Session Build Debug Profile Tools Help

Go to file/function Addins Project: (None)

Conjoint measurement analysis_exercis... design.fractional

	Flavor	Price	Container	Topping
2	Vanilla	1.50 EUR	Cone	Yes
6	Strawberry	2.00 EUR	Cone	Yes
16	Chocolate	2.50 EUR	Cup	Yes
19	Chocolate	1.50 EUR	Cone	No
22	Chocolate	2.00 EUR	Cone	No
26	Vanilla	2.50 EUR	Cone	No
27	Strawberry	2.50 EUR	Cone	No
30	Strawberry	1.50 EUR	Cup	No
32	Vanilla	2.00 EUR	Cup	No

Showing 1 to 9 of 9 entries, 4 total columns

Environment History Connections Tutorial

Import Dataset 229 MiB List

R Global Environment

Data

- design.frac... 9 obs. of 4 variables
- design.full 36 obs. of 4 variables
- experiment 36 obs. of 4 variables

Values

Container	chr [1:2] "Cone" "Cup"
Flavor	chr [1:3] "Chocolate" "vanilla" ...
levelnames	chr [1:10] "chocolate" "vanilla" ...
Price	chr [1:3] "1.50 EUR" "2.00 EUR" ...
Topping	chr [1:2] "Yes" "No"

Files Plots Packages Help Viewer Presentation

Zoom Export

Console Terminal Background Jobs

```
R 4.2.2 . ~/Work/TUM/Teaching/WS22/Empirical Research/
> view(design.full)
> view(design.full)
> design.fractional <- caFactorialDesign(data = experiment,
+                                       type = "orthogonal",
+                                       seed = "123")
> view(design.fractional)
> view(design.fractional)
> |
```

Exercise



- Open the “Conjoint analysis_Exercise.R” script in RStudio
- Load the files “Superfood_profiles.csv” and “Superfood_preferences.csv” in RStudio
- Profiles of 20 chocolates described on 6 attributes (flavor, size, superfood, filling, packaging, price), and preferences for the chocolates (in terms of ranks; 1=most preferred) of $N = 41$ respondents
- Conduct a conjoint analysis with the *conjoint* package
- Check model fit (significance of model, R^2 , significance of regression coefficients)
- Which are the most preferred attribute levels (i.e., those with the highest partworth utilities)?
- How important are the different attributes for the respondents’ preferences?
- What conclusions do you draw from the results? Which product (i.e., attribute profile) would you introduce into the market?

RStudio

File Edit Code View Plots Session Build Debug Profile Tools Help

Go to file/function Addins

```
29 # Generate an orthogonal design with the caFactorialDesign() function of the "conjoint" package
30 design.fractional <- caFactorialDesign(data = experiment,
31                                     type = "orthogonal",
32                                     seed = "123")
33
34 #####
35 ## Conduct conjoint analysis with CHOCOLATES (e.g., to examine effect of containing superfoods)
36 library(conjoint)
37
38 #install.packages("rstudioapi")
39 library(rstudioapi)
40 pathname<-dirname(rstudioapi::getSourceEditorContext()$path)
41 setwd(pathname)
42
43 # Load profiles of the products
44 profiles <- read.csv(file="superfood_profiles.csv",sep = ";", header = T) #
45
46 # Load preference data for the products
47 preferences <- read.csv(file="superfood_preferences.csv",sep = ";", header = T)
48
49 # List the attributes and attribute levels
50 Flavor = c("Fruity", "Nutty", "Mixed")
51 Size = c("5g", "10g", "15g")
52 Superfoods = c("Does not contain superfoods", "Contains superfoods")
53 Filling = c("Creamy", "Liquid")
54 Packaging = c("Individually wrapped in foil", "Individually wrapped in paper", "Not individually wrapped")
55 Price = c("5.99 EUR", "6.99 EUR", "7.99 EUR")
56
57 levelnames <- c(Flavor, Size, Superfoods, Filling, Packaging, Price)
58
59 #Get some information on the R package "Conjoint"
60 ?conjoint
61
62 # Conduct conjoint analysis
63 conjoint(y=preferences, x=profiles, z=levelnames, y.type = "rank")
64
65 #Equivalent to
66 conjoint(y=carankToScore(y.rank=preferences),x=profiles,z=levelnames, y.type = "score")
67
68
69 ShowAllUtilities(y=carankToScore(y.rank=preferences[2,]),x=profiles,z=levelnames)
70
71 |
72
```

Environment History Connections Tutorial

R Global Environment

Data

preferences	41 obs. of 20 variables
profiles	20 obs. of 6 variables

Values

Filling	chr [1:2] "Creamy" "Liquid"
Flavor	chr [1:3] "Fruity" "Nutty" "Mixed"
levelnames	chr [1:16] "Fruity" "Nutty" "Mixed" "5g" "10g" "15g" "Does not contain superfoods" "Contains superfoods"
Packaging	chr [1:3] "Individually wrapped in foil" "Individually wrapped in paper" "Not individually wrapped"
pathname	"C:/Users/pachur/Documents/work/TUM/Teaching/ws23/Empirical Research/Exercises/11_Conjoint analysis/11_Conjoint analysis/11_Conjoint analysis.R"
Price	chr [1:3] "5.99 EUR" "6.99 EUR" "7.99 EUR"
Size	chr [1:3] "5g" "10g" "15g"
Superfoods	chr [1:2] "Does not contain superfoods" "Contains superfoods"

Files Plots Packages Help Viewer Presentation

Zoom Export

71:1 (Untitled) R Script

Console Terminal Background Jobs

R 4.2.2 · ~/Work/TUM/Teaching/WS23/Empirical Research/Exercises/11_Conjoint analysis/

Tippen sie 'q()', um R zu verlassen.

If the preference data are ratings (i.e., higher values indicating higher preference): y.type = "score"

RStudio

File Edit Code View Plots Session Build Debug Profile Tools Help

Go to file/function Addins Project: (None)

Conjoint analysis_Exercise.R profiles

	Flavor	Size	Superfoods	Filling	Packaging	Price
1	2	1	2	2	3	1
2	2	1	1	2	2	3
3	1	1	2	2	1	2
4	1	1	1	2	1	1
5	1	3	1	2	3	2
6	3	3	2	2	1	3
7	1	1	1	1	1	3
8	1	2	2	1	3	3
9	1	2	2	2	2	1
10	2	3	2	1	1	1
11	2	2	1	1	1	2
12	3	2	1	2	1	1
13	1	3	1	1	2	1
14	1	1	2	1	1	1
15	3	1	1	1	3	1
16	3	1	2	1	2	2
17	3	2	2	2	1	1
18	3	1	2	2	3	1
19	2	1	1	1	1	1
20	1	3	1	2	2	2

Environment History Connections Tutorial

Global Environment

Data

- preferences 41 obs. of 20 variables
- profiles 20 obs. of 6 variables

Values

Variable	Type	Values
Filling	chr [1:2]	"Creamy" "Liquid"
Flavor	chr [1:3]	"Fruity" "Nutty" "Mix..."
levelnames	chr [1:16]	"Fruity" "Nutty" "Mi..."
Packaging	chr [1:3]	"Individually wrapped..."
Price	chr [1:3]	"5.99 EUR" "6.99 EUR"...
Size	chr [1:3]	"5g" "10g" "15g"
Superfoods	chr [1:2]	"Does not contain sup..."

RStudio

File Edit Code View Plots Session Build Debug Profile Tools Help

Go to file/function Addins Project: (None)

Conjoint measurement analysis_exercis... profiles preferences

Filter

	Stimulus01	Stimulus02	Stimulus03	Stimulus04	Stimulus05	Stimulus06	Stimulus07	Stimulus08	Stimulus09	Stimulus10	Stimulus11
1	3	19	7	10	9	20	12	1	6	16	
2	13	8	20	19	5	10	14	11	17	1	
3	3	19	6	10	9	20	12	1	7	16	
4	3	18	7	10	9	20	12	1	6	16	
5	3	19	7	10	9	20	12	1	6	16	
6	13	8	20	19	6	10	14	11	17	1	
7	3	19	7	10	9	20	12	1	6	15	
8	13	8	20	19	7	10	14	11	17	1	
9	13	9	20	19	6	10	14	11	17	1	
10	13	8	20	19	6	9	14	11	17	1	
11	14	8	20	19	6	10	13	11	17	1	
12	3	19	7	10	9	20	12	1	6	16	
13	3	19	7	10	9	20	12	1	6	16	
14	3	19	6	10	9	20	12	1	7	16	
15	3	19	7	10	9	20	12	1	6	15	
16	3	18	7	10	9	20	12	1	6	16	
17	14	8	20	19	6	10	13	11	17	1	
18	13	8	20	19	6	10	14	11	17	1	
19	13	8	20	19	5	10	14	11	17	1	
20	13	8	20	19	7	10	14	11	17	1	
21	13	9	20	19	6	10	14	11	17	1	
22	3	19	7	10	9	20	12	1	6	16	
23	3	19	7	10	9	20	12	1	6	16	
24	3	19	6	10	9	20	12	1	7	16	

Showing 1 to 25 of 41 entries, 20 total columns

Environment History 282 MiB

R Global Environment

Data

- pref... 41 obs. ...
- prof... 20 obs. ...

Values

- Fill... chr [1:2] ...
- Flav... chr [1:3] ...
- leve... chr [1:16] ...
- Pack... chr [1:3] ...
- path... "C:/Users/...
- Price chr [1:3] ...
- size chr [1:3] ...
- supe... chr [1:2] ...

Files Plots Packag Zoom Export

Console Terminal Background Jobs

```
R 4.2.2 ~./Work/TUM/Teaching/WS22/Empirical Research/Exercises/11_Conjoint measurement analysis/
> # Load preference data for the products
> preferences <- read.csv(file="Superfood_preferences.csv", sep = ";", header = T)
```

RStudio

File Edit Code View Plots Session Build Debug Profile Tools Help

Go to file/function Addins

```

8
9
10 # Generate profiles for ICE CREAMS (here with 4 attributes. Flavor and Price have 3 attribute levels; container and
11 Flavor <- c("Chocolate", "vanilla", "strawberry")
12 Price <- c("1.50 EUR", "2.00 EUR", "2.50 EUR")
13 Container <- c("Cone", "cup")
14 Topping <- c("Yes", "No")
15
16
68:1 (Untitled)

```

Environment History Connections Tutorial

R Global Environment

Data

preferences	41 obs. of 20 variables
profiles	20 obs. of 6 variables
\$ Flavor	: int 2 2 1 1 1 3 1 1 1 2 ...
\$ Size	: int 1 1 1 1 3 3 1 2 2 3 ...
\$ Superfoods	: int 2 1 2 1 1 2 1 2 2 2 ...
\$ Filling	: int 2 2 2 2 2 2 1 1 2 1 ...
\$ Packaging	: int 3 2 1 1 3 1 1 3 2 1 ...
\$ Price	: int 1 3 2 1 2 3 3 3 1 1 ...

Values

Filling	chr [1:2]	"Creamy" "Liquid"
Flavor	chr [1:3]	"Fruity" "Nutty" "Mixed"
levelnames	chr [1:16]	"Fruity" "Nutty" "Mixed" "5g..."
Packaging	chr [1:3]	"Individually wrapped in foil..."
Price	chr [1:3]	"5.99 EUR" "6.99 EUR" "7.99 E..."
Size	chr [1:3]	"5g" "10g" "15g"
Superfoods	chr [1:2]	"Does not contain superfoods"...

```

> Conjoint(y=caRankToScore(y.rank=preferences),x=profiles,z=levelnames, y.type = "score")

Call:
lm(Formula = frm1)

Residuals:
    Min       1Q   Median       3Q      Max
-8,965 -5,143  0,258  5,014  8,601

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)    11,1524    0,2226  50,098 < 2e-16 ***
factor(x$Flavor)1  -0,3121    0,2488  -1,250  0,210144
factor(x$Flavor)2   0,6665    0,2858   2,332  0,019928 *
factor(x$Size)1    -0,8050    0,2440  -3,300  0,001010 **
factor(x$Size)2     0,2819    0,2863   0,985  0,325029
factor(x$Superfoods)1  0,1338    0,1861   0,719  0,472542
factor(x$Filling)1   1,7547    0,1851   9,480 < 2e-16 ***
factor(x$Packaging)1 -2,0474    0,2440  -8,393 < 2e-16 ***
factor(x$Packaging)2 -0,9522    0,2922  -3,239  0,001167 **
factor(x$Price)1     0,8609    0,2488   3,460  0,000569 ***
factor(x$Price)2     0,2992    0,2946   1,016  0,310015
---
Signif. codes:  0 '***' 0,001 '**' 0,01 '*' 0,05 '.' 0,1 ' ' 1

Residual standard error: 5,107 on 809 degrees of freedom
Multiple R-squared:  0,226,    Adjusted R-squared:  0,2164
F-statistic: 23,62 on 10 and 809 DF,  p-value: < 2,2e-16

[1] "Part worths (utilities) of levels (model parameters for whole sample):"
  levms      utls
1      intercept 11,1524
2      Fruity -0,3121
3      Nutty 0,6665
4      Mixed -0,3544
5          5g -0,805
6         10g 0,2819
7         15g 0,523
8 Does not contain superfoods 0,1338
9 contains superfoods -0,1338
10      creamy 1,7547
11      Liquid -1,7547
12 Individually wrapped in foil -2,0474
13 Individually wrapped in paper -0,9522
14 Not individually wrapped 2,9996
15          5,99 EUR 0,8609
16          6,99 EUR 0,2992
17          7,99 EUR -1,1601
[1] "Average importance of factors (attributes):"
[1] 21,60 26,59 15,41 12,29 17,07 7,05
[1] Sum of average importance: 100,01
[1] "chart of average factors importance"
>

```

Files Plots Packages Help Viewer Presentation

R: Function ShowAllSimulations sums up the results of all... Find in Topic

Author(s)

Andrzej Bak andrzej.bak@ue.wroc.pl

Tomasz Bartlomowicz tomasz.bartlomowicz@ue.wroc.pl

Department of Econometrics and Computer Science, Wroclaw University of Economics, Poland <http://keii.ue.wroc.pl/conjoint>

References

Bak A., Bartlomowicz T. (2012). *Conjoint analysis method and its implementation in conjoint R package*, [In:] Pocielcha J., Decker R. (Eds.), *Data*

```

68
69 #show individual level partworth utilities (for the attributes level) and total utilities for the different profiles
70 ShowAllUtilities(y=carRankToScore(y.rank=preferences),x=profiles,z=levelNames)
71
72
73
74
75
76
77
    
```

71:1 (Untitled)

R 4.2.2 - ~/Work/TUM/Teaching/WS23/Empirical Research/Exercises/11_Conjoint analysis/

```

5          Sg -0,805
6          10g 0,2819
7          15g 0,523
8 Does not contain superfoods 0,1338
9 Contains superfoods -0,1338
10         creamy 1,7547
11         Liquid -1,7547
12 Individually wrapped in foil -2,0474
13 Individually wrapped in paper -0,9522
14 Not individually wrapped 2,9996
15         5.99 EUR 0,8609
16         6.99 EUR 0,2992
17         7.99 EUR -1,1601
    
```

[1] "Part worths (utilities) of all levels including intercept and reference levels a cross of respondents:"

	intercept	Fruity	Nutty	Mixed	Sg	10g	15g	Does not contain superfoods	contains superfoods	creamy	Liquid	Individually wrapped in foil	Individually wrapped in paper	not individually wrapped	5.99 EUR	6.99 EUR	
[1,]	9,477	3,086	-2,373	-0,714	2,585	1,305	-3,890	-2,091	2,091	0,886	-0,886	-2,990	-2,284	0,265	5,275	1,747	0,400
[2,]	12,784	-3,495	3,622	-0,127	-4,161	-0,619	4,780	2,283	-2,283	2,466	-2,466	-1,222	0,265	0,957	-0,005	0,319	
[3,]	9,442	3,083	-2,395	-0,687	2,730	1,126	-3,856	-2,102	2,102	0,873	-0,873	-2,815	-2,493	5,308	1,584	0,607	
[4,]	9,505	2,964	-2,210	-0,754	2,701	1,337	-4,038	-2,082	2,082	0,854	-0,854	-3,026	-2,219	5,246	1,702	0,213	
[5,]	9,408	3,238	-2,346	-0,892	2,607	1,286	-3,894	-2,226	2,226	0,873	-0,873	-2,847	-2,257	5,105	1,762	0,395	
[6,]	12,760	-3,593	3,552	0,041	-4,050	-0,605	4,655	2,309	-2,309	2,572	-2,572	-1,262	0,352	0,910	0,093	0,191	
[7,]	9,499	3,069	-2,178	-0,891	2,556	1,101	-3,658	-2,246	2,246	0,977	-0,977	-2,989	-2,294	5,283	1,764	0,394	
[8,]	12,752	-3,611	3,547	0,064	-4,025	-0,607	4,632	2,294	-2,294	2,573	-2,573	-1,267	0,571	0,696	0,111	0,166	
[9,]	12,700	-3,551	3,350	0,201	-4,188	-0,476	4,664	2,349	-2,349	2,600	-2,600	-1,128	0,179	0,948	0,218	0,265	
[10,]	12,809	-3,620	3,570	0,050	-4,048	-0,832	4,880	2,183	-2,183	2,576	-2,576	-1,230	0,335	0,895	-0,047	0,131	
[11,]	12,743	-3,465	3,311	0,155	-4,024	-0,605	4,629	2,406	-2,406	2,672	-2,672	-1,115	0,357	0,758	-0,035	0,127	
[12,]	9,477	3,086	-2,373	-0,714	2,585	1,305	-3,890	-2,091	2,091	0,886	-0,886	-2,990	-2,284	0,957	1,747	0,400	
[13,]	9,408	3,238	-2,346	-0,892	2,607	1,286	-3,894	-2,226	2,226	0,873	-0,873	-2,847	-2,257	5,105	1,762	0,395	
[14,]	9,442	3,083	-2,395	-0,687	2,730	1,126	-3,856	-2,102	2,102	0,873	-0,873	-2,815	-2,493	5,308	1,584	0,607	
[15,]	9,499	3,069	-2,178	-0,891	2,556	1,101	-3,658	-2,246	2,246	0,977	-0,977	-2,989	-2,294	5,283	1,764	0,394	
[16,]	9,505	2,964	-2,210	-0,754	2,701	1,337	-4,038	-2,082	2,082	0,854	-0,854	-3,026	-2,219	5,246	1,702	0,213	
[17,]	12,743	-3,465	3,311	0,155	-4,024	-0,605	4,629	2,406	-2,406	2,672	-2,672	-1,115	0,357	0,758	-0,035	0,127	
[18,]	12,760	-3,593	3,552	0,041	-4,050	-0,605	4,655	2,309	-2,309	2,572	-2,572	-1,262	0,352	0,910	0,093	0,191	
[19,]	12,784	-3,495	3,622	-0,127	-4,161	-0,619	4,780	2,283	-2,283	2,466	-2,466	-1,222	0,265	0,957	-0,005	0,319	
[20,]	12,752	-3,611	3,547	0,064	-4,025	-0,607	4,632	2,294	-2,294	2,573	-2,573	-1,267	0,571	0,696	0,111	0,166	
[21,]	12,700	-3,551	3,350	0,201	-4,188	-0,476	4,664	2,349	-2,349	2,600	-2,600	-1,128	0,179	0,948	0,218	0,265	
[22,]	9,477	3,086	-2,373	-0,714	2,585	1,305	-3,890	-2,091	2,091	0,886	-0,886	-2,990	-2,284	0,957	1,747	0,400	
[23,]	9,408	3,238	-2,346	-0,892	2,607	1,286	-3,894	-2,226	2,226	0,873	-0,873	-2,847	-2,257	5,105	1,762	0,395	
[24,]	9,442	3,083	-2,395	-0,687	2,730	1,126	-3,856	-2,102	2,102	0,873	-0,873	-2,815	-2,493	5,308	1,584	0,607	
[25,]	9,499	3,069	-2,178	-0,891	2,556	1,101	-3,658	-2,246	2,246	0,977	-0,977	-2,989	-2,294	5,283	1,764	0,394	
[26,]	9,505	2,964	-2,210	-0,754	2,701	1,337	-4,038	-2,082	2,082	0,854	-0,854	-3,026	-2,219	5,246	1,702	0,213	
[27,]	12,809	-3,620	3,570	0,050	-4,048	-0,832	4,880	2,183	-2,183	2,576	-2,576	-1,230	0,335	0,895	-0,047	0,131	
[28,]	12,743	-3,465	3,311	0,155	-4,024	-0,605	4,629	2,406	-2,406	2,672	-2,672	-1,115	0,357	0,758	-0,035	0,127	
[29,]	12,760	-3,593	3,552	0,041	-4,050	-0,605	4,655	2,309	-2,309	2,572	-2,572	-1,262	0,352	0,910	0,093	0,191	
[30,]	12,784	-3,495	3,622	-0,127	-4,161	-0,619	4,780	2,283	-2,283	2,466	-2,466	-1,222	0,265	0,957	-0,005	0,319	
[31,]	12,752	-3,611	3,547	0,064	-4,025	-0,607	4,632	2,294	-2,294	2,573	-2,573	-1,267	0,571	0,696	0,111	0,166	
[32,]	9,477	3,086	-2,373	-0,714	2,585	1,305	-3,890	-2,091	2,091	0,886	-0,886	-2,990	-2,284	0,957	1,747	0,400	
[33,]	9,408	3,238	-2,346	-0,892	2,607	1,286	-3,894	-2,226	2,226	0,873	-0,873	-2,847	-2,257	5,105	1,762	0,395	
[34,]	9,442	3,083	-2,395	-0,687	2,730	1,126	-3,856	-2,102	2,102	0,873	-0,873	-2,815	-2,493	5,308	1,584	0,607	
[35,]	9,499	3,069	-2,178	-0,891	2,556	1,101	-3,658	-2,246	2,246	0,977	-0,977	-2,989	-2,294	5,283	1,764	0,394	
[36,]	9,505	2,964	-2,210	-0,754	2,701	1,337	-4,038	-2,082	2,082	0,854	-0,854	-3,026	-2,219	5,246	1,702	0,213	
[37,]	12,700	-3,551	3,350	0,201	-4,188	-0,476	4,664	2,349	-2,349	2,600	-2,600	-1,128	0,179	0,948	0,218	0,265	
[38,]	12,809	-3,620	3,570	0,050	-4,048	-0,832	4,880	2,183	-2,183	2,576	-2,576	-1,230	0,335	0,895	-0,047	0,131	
[39,]	12,743	-3,465	3,311	0,155	-4,024	-0,605	4,629	2,406	-2,406	2,672	-2,672	-1,115	0,357	0,758	-0,035	0,127	
[40,]	12,760	-3,593	3,552	0,041	-4,050	-0,605	4,655	2,309	-2,309	2,572	-2,572	-1,262	0,352	0,910	0,093	0,191	
[41,]	12,784	-3,495	3,622	-0,127	-4,161	-0,619	4,780	2,283	-2,283	2,466	-2,466	-1,222	0,265	0,957	-0,005	0,319	
[1,]	-2,147																
[2,]	-0,314																
[3,]	-2,191																
[4,]	-1,915																
[5,]	-2,157																
[6,]	-0,284																
[7,]	-2,159																
[8,]	-0,276																

Environment

R - Global Environment

Data

- preference
- profiles
- Flavor
- Size
- Superf
- Fillfr
- Package
- Price

Values

- Filling
- Flavor
- LevelNames
- Packaging
- Price
- Size
- Superfoods

Files Plots

R. Function Sho

Author(s)

Andrzej Bak [and](#)

Tomasz Bartlom

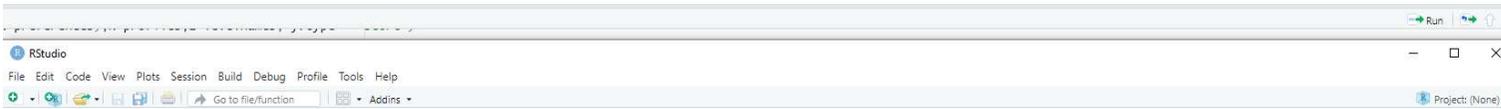
Department of E
University of Ec

References

Bak A., Bartlom
implementation
(Eds.), Data an
Warszawa, p.23

Bak A. (2009),





```
68
69 #Show individual-level partworth utilities (for the attributes level) and total utilities for the different profiles
70 ShowAllUtilities(y=c(ranktoScore(y.rank-preferences),x=profiles,z=levelnames))
71
72
73
74
75
76
77
78
```

Console Terminal Background Jobs

```
R 4.2.2 - ~/Work/TUM/Teaching/WS23/Empirical_Research/Exercises/11_Conjoint_analysis/
[36.] -1,915
[37.] -0,483
[38.] -0,084
[39.] -0,092
[40.] -0,284
[41.] -0,344
```

→ Estimated utilities

[1] "Total utilities of profiles a cross of respondents:"

	[.1]	[.2]	[.3]	[.4]	[.5]	[.6]	[.7]	[.8]	[.9]	[.10]	[.11]	[.12]	[.13]	[.14]	[.15]	[.16]	[.17]	[.18]
[1.]	17,916	2,282	13,763	10,929	11,371	0,940	8,806	19,972	14,535	4,947	4,614	5,849	6,931	16,882	17,166	12,441	10,030	19,577
[2.]	8,447	12,011	-0,525	3,717	15,161	11,152	8,341	9,497	4,180	20,142	19,633	10,628	19,077	4,084	14,197	9,263	6,062	4,699
[3.]	17,897	2,117	14,276	11,048	11,607	1,121	9,019	19,743	13,971	4,935	4,735	5,673	6,530	16,999	17,147	12,575	9,878	19,600
[4.]	18,172	2,925	13,585	10,910	10,955	1,000	9,001	20,074	14,517	4,869	4,590	5,827	6,687	16,782	17,172	12,381	9,992	19,621
[5.]	17,888	2,155	14,153	11,069	11,153	0,970	8,896	19,978	14,789	5,182	4,543	5,619	6,904	17,267	16,638	12,360	10,070	19,344
[6.]	8,384	12,068	-0,834	3,685	14,660	11,030	8,452	9,451	4,126	20,060	19,516	10,763	19,148	4,211	14,634	9,556	6,145	4,877
[7.]	18,193	2,202	13,799	10,677	11,365	1,072	8,709	20,018	14,409	5,662	4,559	5,261	7,113	17,124	16,943	12,489	9,753	19,448
[8.]	8,215	12,290	-0,852	3,681	14,356	11,037	8,439	9,233	4,350	20,053	19,457	10,774	19,322	4,239	14,465	9,807	6,186	4,733
[9.]	8,078	11,307	-0,851	3,800	14,776	11,005	8,299	9,389	4,120	20,054	19,661	11,264	19,159	4,301	14,828	9,408	6,566	4,921
[10.]	8,419	12,188	-0,719	3,471	14,702	11,665	8,586	9,561	3,885	20,374	19,206	10,357	19,117	4,256	14,419	9,669	5,990	4,891
[11.]	7,675	12,029	-0,812	3,839	14,527	11,242	9,125	9,604	3,916	19,799	19,538	10,877	19,307	4,370	14,675	9,623	6,064	4,511
[12.]	17,916	2,282	13,763	10,929	11,371	0,940	8,806	19,972	14,535	4,947	4,614	5,849	6,931	16,882	17,166	12,441	10,030	19,577
[13.]	17,888	2,155	14,153	11,069	11,153	0,970	8,896	19,978	14,789	5,182	4,543	5,619	6,904	17,267	16,638	12,360	10,070	19,344
[14.]	17,897	2,117	14,276	11,048	11,607	1,121	9,019	19,743	13,971	4,935	4,735	5,673	6,530	16,999	17,147	12,575	9,878	19,600
[15.]	18,193	2,202	13,799	10,677	11,365	1,072	8,709	20,018	14,409	5,662	4,559	5,261	7,113	17,124	16,943	12,489	9,753	19,448
[16.]	18,172	2,925	13,585	10,910	10,955	1,000	9,001	20,074	14,517	4,869	4,590	5,827	6,687	16,782	17,172	12,381	9,992	19,621
[17.]	7,675	12,029	-0,812	3,839	14,527	11,242	9,125	9,604	3,916	19,799	19,538	10,877	19,307	4,370	14,675	9,623	6,064	4,511
[18.]	8,384	12,068	-0,834	3,685	14,660	11,030	8,452	9,451	4,126	20,060	19,516	10,763	19,148	4,211	14,634	9,556	6,145	4,877
[19.]	8,447	12,011	-0,525	3,717	15,161	11,152	8,341	9,497	4,180	20,142	19,633	10,628	19,077	4,084	14,197	9,263	6,062	4,699
[20.]	8,215	12,290	-0,852	3,681	14,356	11,037	8,439	9,233	4,350	20,053	19,457	10,774	19,322	4,239	14,465	9,807	6,186	4,733
[21.]	8,078	11,307	-0,851	3,800	14,776	11,005	8,299	9,389	4,120	20,054	19,661	11,264	19,159	4,301	14,828	9,408	6,566	4,921
[22.]	17,916	2,282	13,763	10,929	11,371	0,940	8,806	19,972	14,535	4,947	4,614	5,849	6,931	16,882	17,166	12,441	10,030	19,577
[23.]	17,888	2,155	14,153	11,069	11,153	0,970	8,896	19,978	14,789	5,182	4,543	5,619	6,904	17,267	16,638	12,360	10,070	19,344
[24.]	17,897	2,117	14,276	11,048	11,607	1,121	9,019	19,743	13,971	4,935	4,735	5,673	6,530	16,999	17,147	12,575	9,878	19,600
[25.]	18,193	2,202	13,799	10,677	11,365	1,072	8,709	20,018	14,409	5,662	4,559	5,261	7,113	17,124	16,943	12,489	9,753	19,448
[26.]	18,172	2,925	13,585	10,910	10,955	1,000	9,001	20,074	14,517	4,869	4,590	5,827	6,687	16,782	17,172	12,381	9,992	19,621
[27.]	8,419	12,188	-0,719	3,471	14,702	11,665	8,586	9,561	3,885	20,374	19,206	10,357	19,117	4,256	14,419	9,669	5,990	4,891
[28.]	7,675	12,029	-0,812	3,839	14,527	11,242	9,125	9,604	3,916	19,799	19,538	10,877	19,307	4,370	14,675	9,623	6,064	4,511
[29.]	8,384	12,068	-0,834	3,685	14,660	11,030	8,452	9,451	4,126	20,060	19,516	10,763	19,148	4,211	14,634	9,556	6,145	4,877
[30.]	8,447	12,011	-0,525	3,717	15,161	11,152	8,341	9,497	4,180	20,142	19,633	10,628	19,077	4,084	14,197	9,263	6,062	4,699
[31.]	8,215	12,290	-0,852	3,681	14,356	11,037	8,439	9,233	4,350	20,053	19,457	10,774	19,322	4,239	14,465	9,807	6,186	4,733
[32.]	17,916	2,282	13,763	10,929	11,371	0,940	8,806	19,972	14,535	4,947	4,614	5,849	6,931	16,882	17,166	12,441	10,030	19,577
[33.]	17,888	2,155	14,153	11,069	11,153	0,970	8,896	19,978	14,789	5,182	4,543	5,619	6,904	17,267	16,638	12,360	10,070	19,344
[34.]	17,897	2,117	14,276	11,048	11,607	1,121	9,019	19,743	13,971	4,935	4,735	5,673	6,530	16,999	17,147	12,575	9,878	19,600
[35.]	18,193	2,202	13,799	10,677	11,365	1,072	8,709	20,018	14,409	5,662	4,559	5,261	7,113	17,124	16,943	12,489	9,753	19,448
[36.]	18,172	2,925	13,585	10,910	10,955	1,000	9,001	20,074	14,517	4,869	4,590	5,827	6,687	16,782	17,172	12,381	9,992	19,621
[37.]	8,078	11,307	-0,851	3,800	14,776	11,005	8,299	9,389	4,120	20,054	19,661	11,264	19,159	4,301	14,828	9,408	6,566	4,921
[38.]	8,419	12,188	-0,719	3,471	14,702	11,665	8,586	9,561	3,885	20,374	19,206	10,357	19,117	4,256	14,419	9,669	5,990	4,891
[39.]	7,675	12,029	-0,812	3,839	14,527	11,242	9,125	9,604	3,916	19,799	19,538	10,877	19,307	4,370	14,675	9,623	6,064	4,511
[40.]	8,384	12,068	-0,834	3,685	14,660	11,030	8,452	9,451	4,126	20,060	19,516	10,763	19,148	4,211	14,634	9,556	6,145	4,877
[41.]	8,447	12,011	-0,525	3,717	15,161	11,152	8,341	9,497	4,180	20,142	19,633	10,628	19,077	4,084	14,197	9,263	6,062	4,699



```
Conjoint measurement analysis_exercis... | profiles | preferences |
Filter
Stimulus01 Stimulus02 Stimulus03 Stimulus04 Stimulus05 Stimulus06 Stimulus07 Stimulus08 Stimulus09 Stimulus10 Stimulus11
1 3 19 7 10 9 20 12 1 6 16
2 13 8 20 19 5 10 14 11 17 1
3 3 19 6 16
4 3 18 7 16
5 3 19 7 16
6 13 8 20 19 6 10 14 11 17 1
7 3 19 7 16
8 13 8 20 16
9 13 8 20 19 6 10 14 11 17 1
10 13 8 20 19 6 10 14 11 17 1
11 14 8 20 19 6 10 13 11 17 1
12 3 19 7 10 9 20 12 1 6 16
13 3 19 7 10 9 20 12 1 6 16
14 3 19 6 10 9 20 12 1 7 16
15 3 19 7 10 9 20 12 1 6 15
16 3 18 7 10 9 20 12 1 6 16
17 14 8 20 19 6 10 13 11 17 1
18 13 8 20 19 6 10 14 11 17 1
19 13 8 20 19 5 10 14 11 17 1
20 13 8 20 19 7 10 9 20 12 1 6 16
21 13 9 20 19 6 10 14 11 17 1
22 3 19 7 10 9 20 12 1 6 16
23 3 19 7 10 9 20 12 1 6 16
24 3 19 6 10 9 20 12 1 7 16
```

→ Preference ranks for the 20 chocolates by N = 41 respondents

Environment History

R 4.2.2 Global Environment

Data

- pref... 41 obs. ...
- prof... 20 obs. ...

values

- Fill... chr [1:2] ...
- Flav... chr [1:3] ...
- leve... chr [1:16] ...
- Pack... chr [1:3] ...
- path... "C:/Users/..."
- Price chr [1:3] ...
- Size chr [1:3] ...
- Supe... chr [1:2] ...

Files Plots Package

Zoom Export

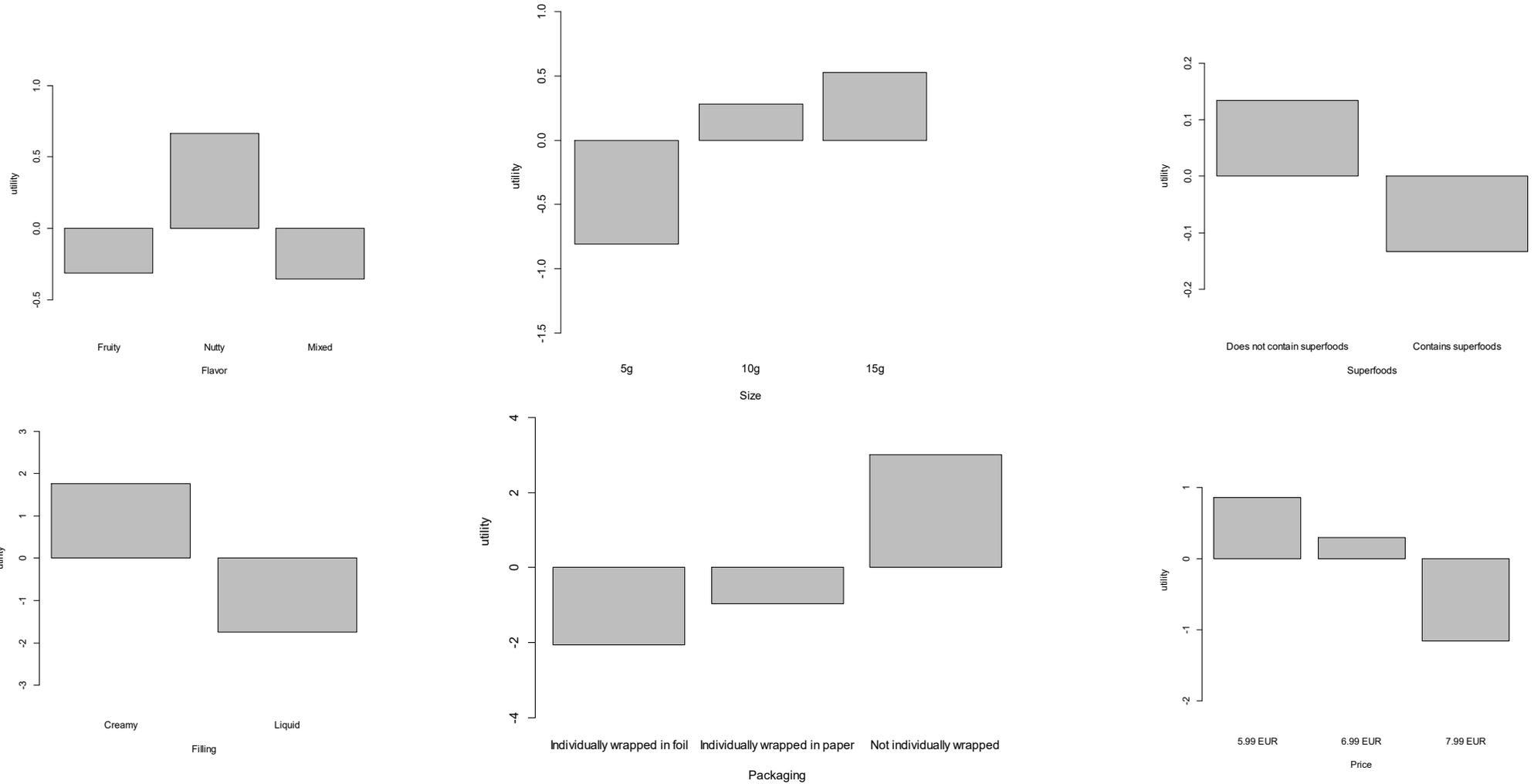
Showing 1 to 25 of 41 entries, 20 total columns

```
Console Terminal Background Jobs
R 4.2.2 - ~/Work/TUM/Teaching/WS22/Empirical_Research/Exercises/11_Conjoint measurement analysis/
> # Load preference data for the products
> preferences <- read.csv(file="Superfood_preferences.csv",sep = ";", header = T)
```

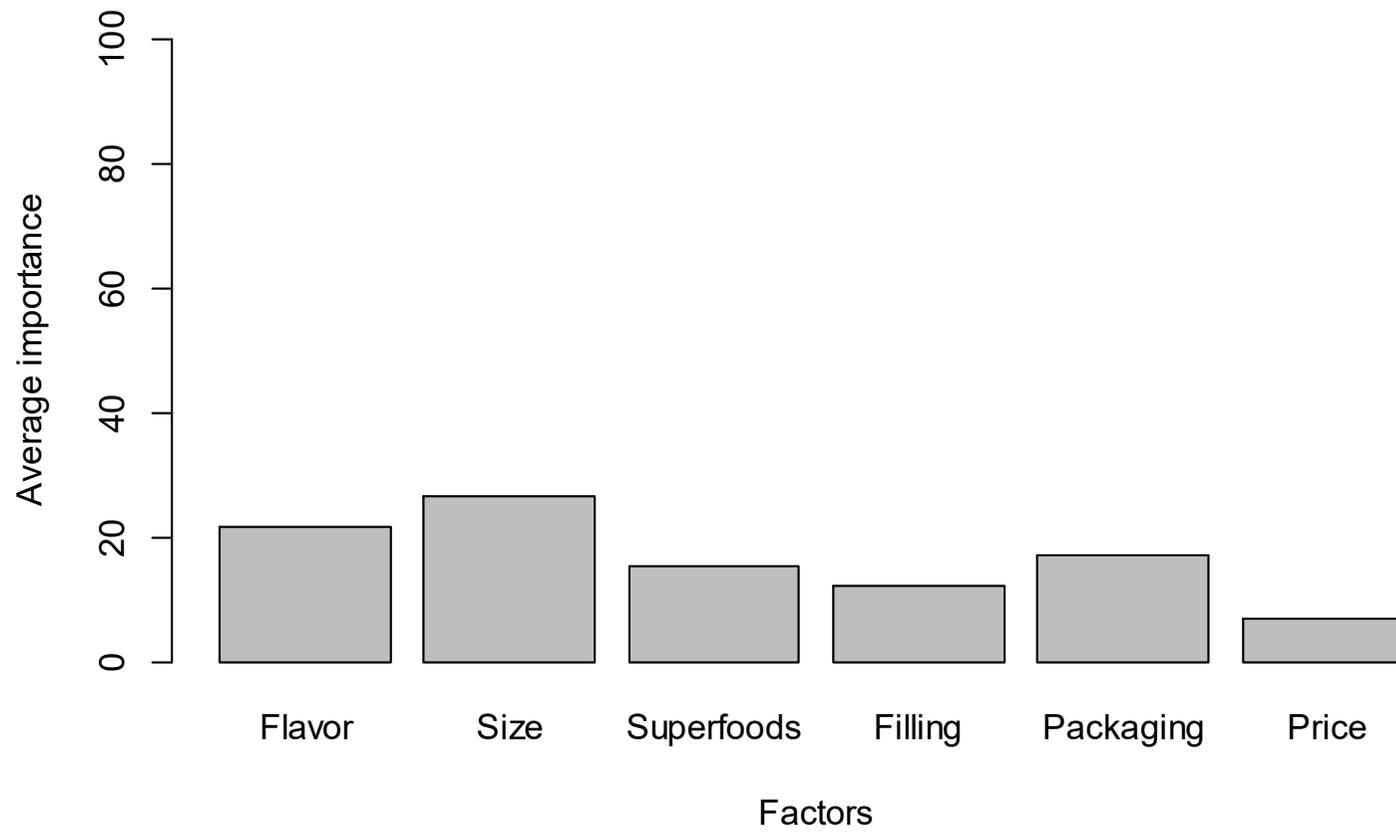
```
15,973 14,102
1,915 15,767 14,468
tomasz.bartlomowicz@us
Department of
Econometrics and
Computer Science,
Wroclaw University of
```

warnmeldungen:
1: In dottycatch(return(expr), name, parentenv, handler) :

Partworth utilities of the attribute levels



Importances of the attributes



Attribute importance

$$w_j = \frac{\text{Range}}{\sum_{j=1}^J (\max\{b_{jl}\} - \min\{b_{jl}\})}$$

→ Note: The average (across respondents) importance weights reported in the R output differ from the importance weights calculated based on the (aggregate) partworth utilities! The calculation of attribute importance discussed in the lecture holds for the calculation of individual-level importance weights

	Attribute values	Regression weights (b)	Partworth utilities	Range	Importance (w)
Intercept		4.750			
Flavor 1	<i>Fruity</i>	-1.000	-1.000		
Flavor 2	<i>Nutty</i>	1.667	1.667	1.667 - (-1.000) = 2.667	2.667/8.834 = 0.301
	<i>Mixed</i>	0.667	0.667		
Price 1	1.50€	0.667	0.667		
Price 2	2.00€	2.667	2.667	2.667 - (-2.000) = 4.667	4.667/8.834 = 0.529
	2.50€	-2.000	-2.000		
Container	<i>Cone</i>	0.500	0.500	0.500 - (-0.500) = 1.000	1.000/8.834 = 0.113
	<i>Cup</i>		-0.500		
Topping	<i>Yes</i>	-0.250	-0.250	0.250 - (-0.250) = 0.500	0.500/8.834 = 0.057
	<i>No</i>		0.250		

Σ = 8.834