Pulses 2021 - drivers and barriers

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This markdown includes code and output for factor analyses

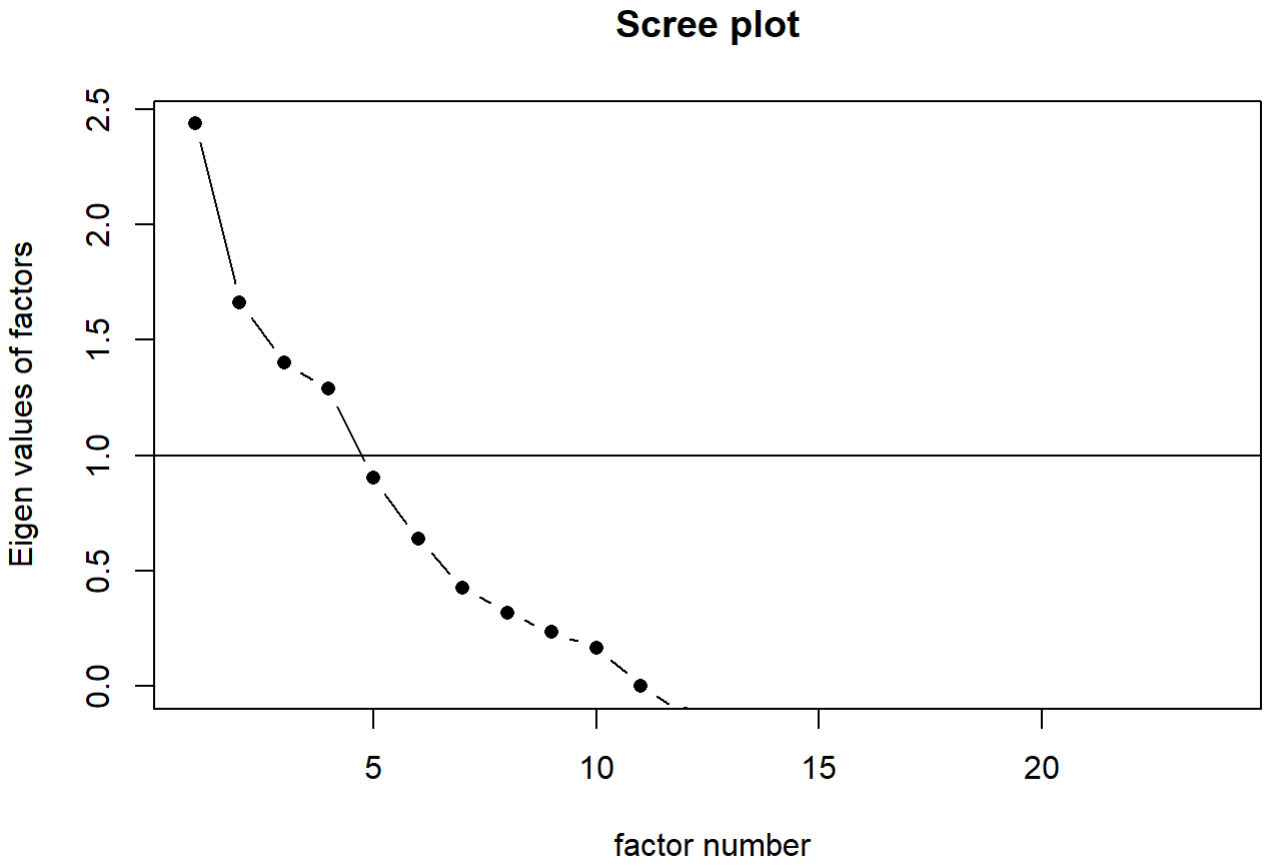
The factor analysis relates to this article: *Barriers and drivers for increasing future pulse consumption from frequent and infrequent consumers' perspectives in Denmark*

Heavy users

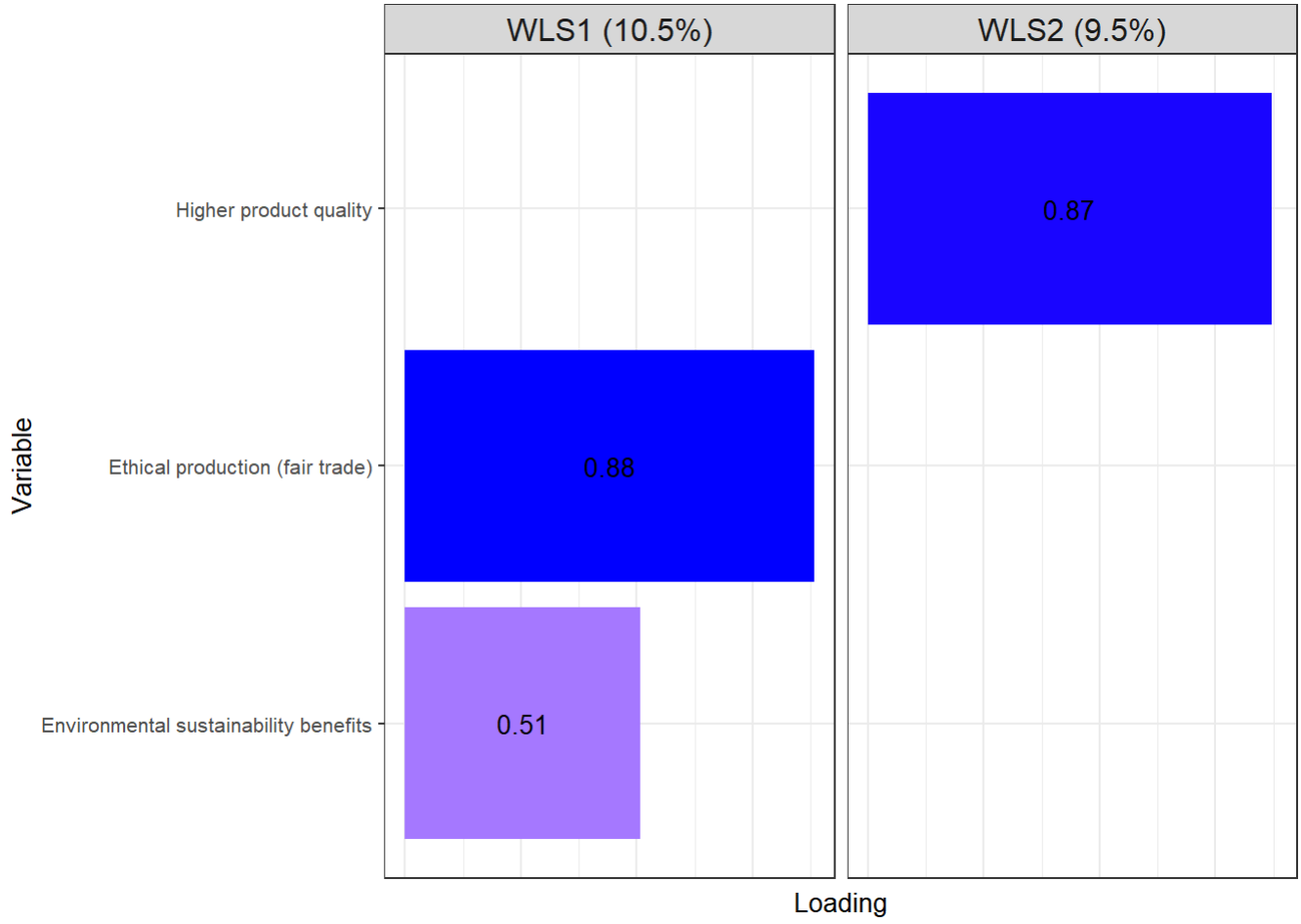
FA on tetrachoric correlations

- Numbers of factor determined with screeplot. Factor should explain more than one variable (eigenvalue > 1)
- Factor analysis with minimum residual for extraction and Varimax for rotation.
- Explained variance of total variance in

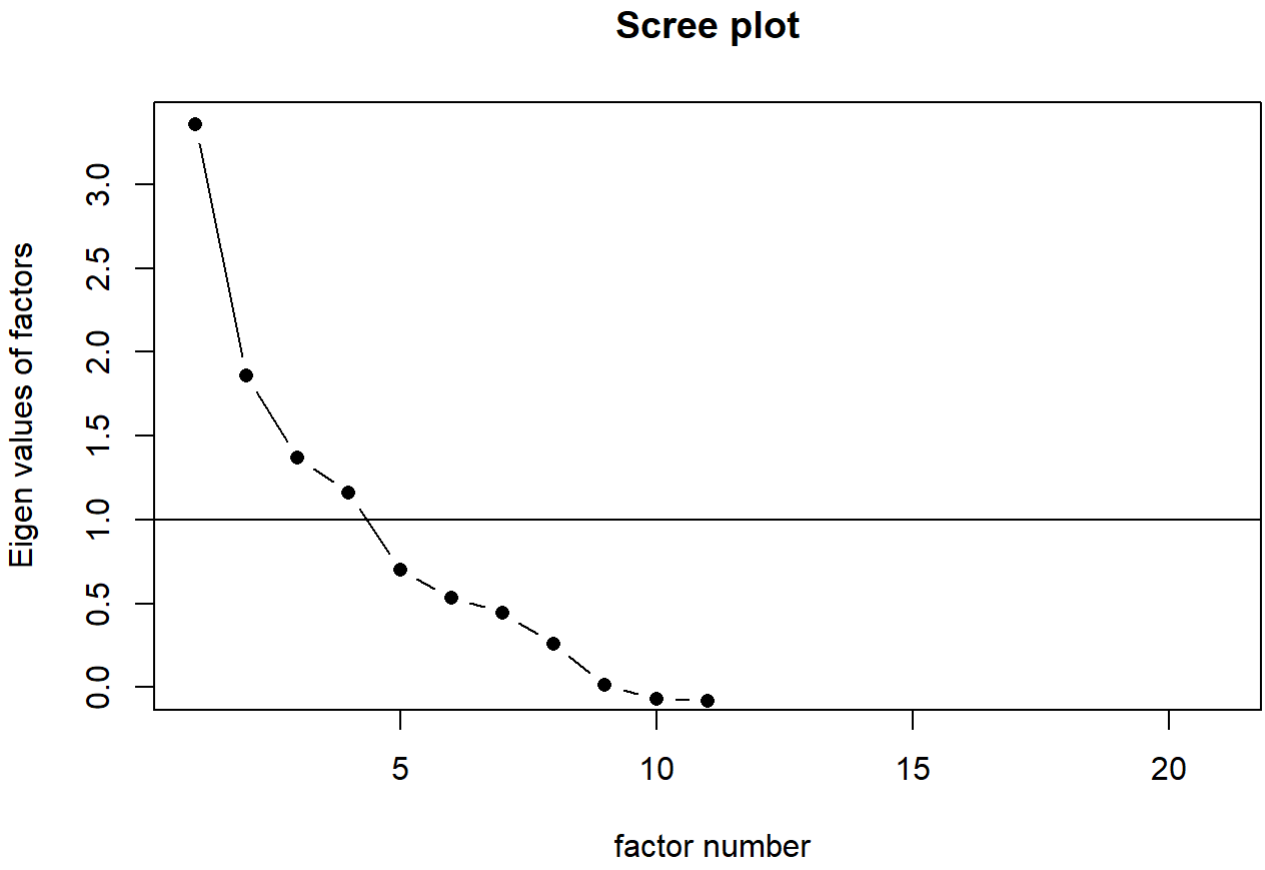
Drivers


Scree plot
Eigen values of factors
0.0
0.5
1.0
1.5
2.0
2.5
5
10
15
20
factor number

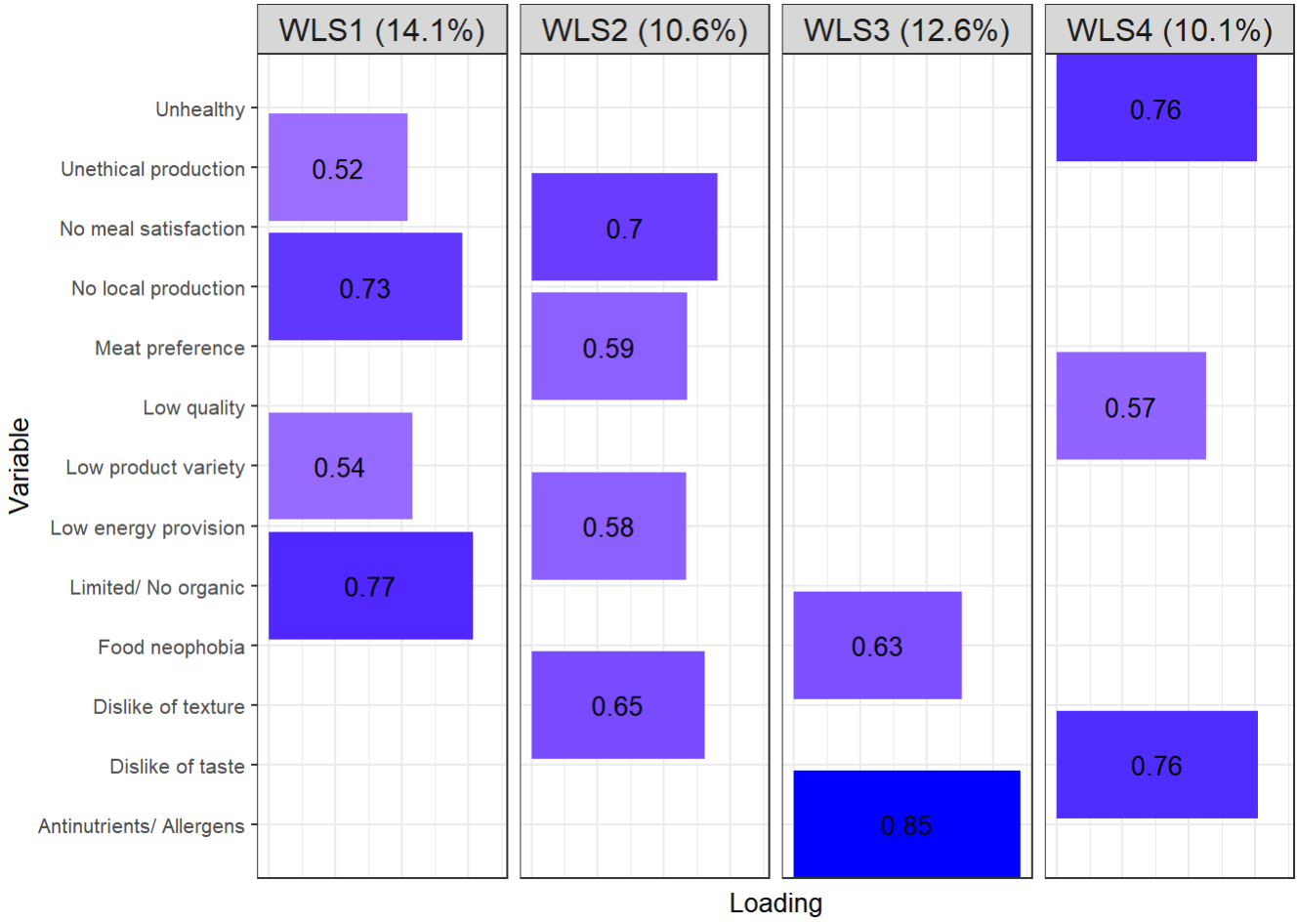
```
## Factor Analysis using method =  wls
## Call: fa(r = ., nfactors = 4, rotate = "varimax", fm = "wls")
## Standardized loadings (pattern matrix) based upon correlation matrix
##                                       WLS1  WLS2  WLS4  WLS3    h2    u2 com
## Health and nutritional benefits        0.10 -0.50  0.00 -0.05 0.265 0.735 1.1
## Health proffesionals advice           -0.26  0.14  0.06  0.00 0.090 0.910 1.7
## Weight benefits                       -0.03  0.27  0.27 -0.15 0.170 0.830 2.6
## Thriving physically                   -0.19 -0.36  0.33  0.19 0.315 0.685 3.1
## Environmental sustainability benefits  0.51 -0.42  0.04 -0.05 0.439 0.561 2.0
## Official dietary guidelines            0.01 -0.13 -0.18  0.21 0.094 0.906 2.6
## Animal welfare                         0.32 -0.08  0.08 -0.48 0.348 0.652 1.9
## Ethical production (fair trade)        0.88 -0.07  0.38 -0.07 0.932 0.068 1.4
## Minimal processing and high naturalness 0.47  0.03 -0.13  0.11 0.247 0.753 1.3
## Knowledge protein                      0.16 -0.43  0.24 -0.21 0.311 0.689 2.4
## Local production                       0.37  0.00 -0.33  0.15 0.271 0.729 2.3
## Transparency production                0.38  0.42  0.41  0.32 0.596 0.404 3.8
## Greater availability out               -0.30  0.38  0.36  0.00 0.368 0.632 2.9
## Product diversity                      0.34  0.32  0.11  0.50 0.479 0.521 2.7
## Improved taste                        -0.17  0.06 -0.61  0.26 0.478 0.522 1.5
## Higher product quality                 0.13  0.87  0.03 -0.03 0.778 0.222 1.0
## Improved texture                      -0.02  0.08 -0.68  0.14 0.495 0.505 1.1
## Better convenience products           -0.33 -0.02 -0.12  0.15 0.146 0.854 1.7
## Lower prices                          -0.21  0.22 -0.38 -0.29 0.323 0.677 3.2
## Knowledge recipes                     -0.25 -0.32  0.24  0.31 0.317 0.683 3.8
## Eating habits other people            -0.50 -0.25  0.15  0.23 0.389 0.611 2.2
## Diet variation                        -0.01 -0.05  0.11 -0.60 0.376 0.624 1.1
## Product exploration                    0.06  0.03 -0.02 -0.74 0.548 0.452 1.0
## Trend / lifestyle / popularity        -0.12  0.04  0.40  0.14 0.196 0.804 1.4
##
##                        WLS1 WLS2 WLS4 WLS3
## SS loadings            2.52 2.28 2.12 2.05
## Proportion Var         0.10 0.10 0.09 0.09
## Cumulative Var         0.10 0.20 0.29 0.37
## Proportion Explained   0.28 0.25 0.24 0.23
## Cumulative Proportion 0.28 0.53 0.77 1.00
##
## Mean item complexity =  2.1
## Test of the hypothesis that 4 factors are sufficient.
##
## df null model =  276  with the objective function =  72.89
## df of  the model are 186  and the objective function was  68.36
##
## The root mean square of the residuals (RMSR) is  0.1
## The df corrected root mean square of the residuals is  0.12
##
## Fit based upon off diagonal values = 0.68
## Measures of factor score adequacy
##                                                 WLS1 WLS2 WLS4 WLS3
## Correlation of (regression) scores with factors   0.95 0.95 0.94 0.94
## Multiple R square of scores with factors          0.91 0.90 0.88 0.89
## Minimum correlation of possible factor scores     0.81 0.80 0.75 0.77
```


WLS1 (10.5%)
WLS2 (9.5%)
Higher product quality
Ethical production (fair trade)
Environmental sustainability benefits
0.87
0.88
0.51
Variable
Loading

Barriers


Scree plot
Eigen values of factors
0.0
0.5
1.0
1.5
2.0
2.5
3.0
5
10
15
20
factor number

```
## Factor Analysis using method =  wls
## Call: fa(r = ., nfactors = 4, rotate = "varimax", fm = "wls")
## Standardized loadings (pattern matrix) based upon correlation matrix
##                                 WLS1  WLS3  WLS2  WLS4   h2   u2 com
## Low product variety              0.54 -0.26 -0.15 -0.09 0.39 0.61 1.7
## Low quality                      0.22  0.03 -0.01  0.57 0.37 0.63 1.3
## Limited/ No organic              0.77  0.02 -0.15  0.03 0.61 0.39 1.1
## Nutritional deficiencies         0.35  0.30 -0.14 -0.05 0.24 0.76 2.3
## Low value for money              0.43 -0.03  0.11  0.07 0.20 0.80 1.2
## Dislike of taste                -0.21 -0.18  0.39  0.76 0.80 0.20 1.8
## Dislike of texture              -0.22 -0.35  0.65  0.43 0.78 0.22 2.6
## Close circle does not consume   -0.18 -0.22 -0.01  0.18 0.11 0.89 2.9
## Low knowledge on preparation    -0.33 -0.53 -0.18  0.17 0.45 0.55 2.2
## Long preparation                 0.11 -0.47 -0.12  0.01 0.25 0.75 1.2
## No local production              0.73  0.06 -0.01  0.14 0.56 0.44 1.1
## Antinutrients/ Allergens         0.04  0.85 -0.10  0.26 0.81 0.19 1.2
## Not enviromentally sustainable   0.33  0.46 -0.30  0.40 0.57 0.43 3.6
## Food neophobia                  -0.15  0.63  0.02 -0.07 0.43 0.57 1.1
## Low/no familiarity              -0.49 -0.02 -0.09 -0.03 0.25 0.75 1.1
## Unhealthy                        0.23  0.30 -0.29  0.76 0.79 0.21 1.8
## No meal satisfaction             0.10  0.22  0.70  0.03 0.55 0.45 1.2
## Meat preference                 -0.14  0.05  0.59 -0.13 0.38 0.62 1.2
## Discomfort after consumption     0.02  0.48  0.17  0.31 0.35 0.65 2.0
## Low energy provision             0.46  0.27  0.58  0.12 0.63 0.37 2.4
## Unethical production             0.52  0.06 -0.35  0.15 0.42 0.58 2.0
##
##                        WLS1 WLS3 WLS2 WLS4
## SS loadings            2.95 2.65 2.22 2.13
## Proportion Var         0.14 0.13 0.11 0.10
## Cumulative Var         0.14 0.27 0.37 0.47
## Proportion Explained   0.30 0.27 0.22 0.21
## Cumulative Proportion 0.30 0.56 0.79 1.00
##
## Mean item complexity =  1.8
## Test of the hypothesis that 4 factors are sufficient.
##
## df null model =  210  with the objective function =  95.32
## df of  the model are 132  and the objective function was  89.36
##
## The root mean square of the residuals (RMSR) is  0.1
## The df corrected root mean square of the residuals is  0.13
##
## Fit based upon off diagonal values = 0.8
## Measures of factor score adequacy
##                                                  WLS1 WLS3 WLS2 WLS4
## Correlation of (regression) scores with factors   0.96 0.98 0.98 0.98
## Multiple R square of scores with factors          0.92 0.95 0.96 0.97
## Minimum correlation of possible factor scores     0.83 0.90 0.91 0.93
```

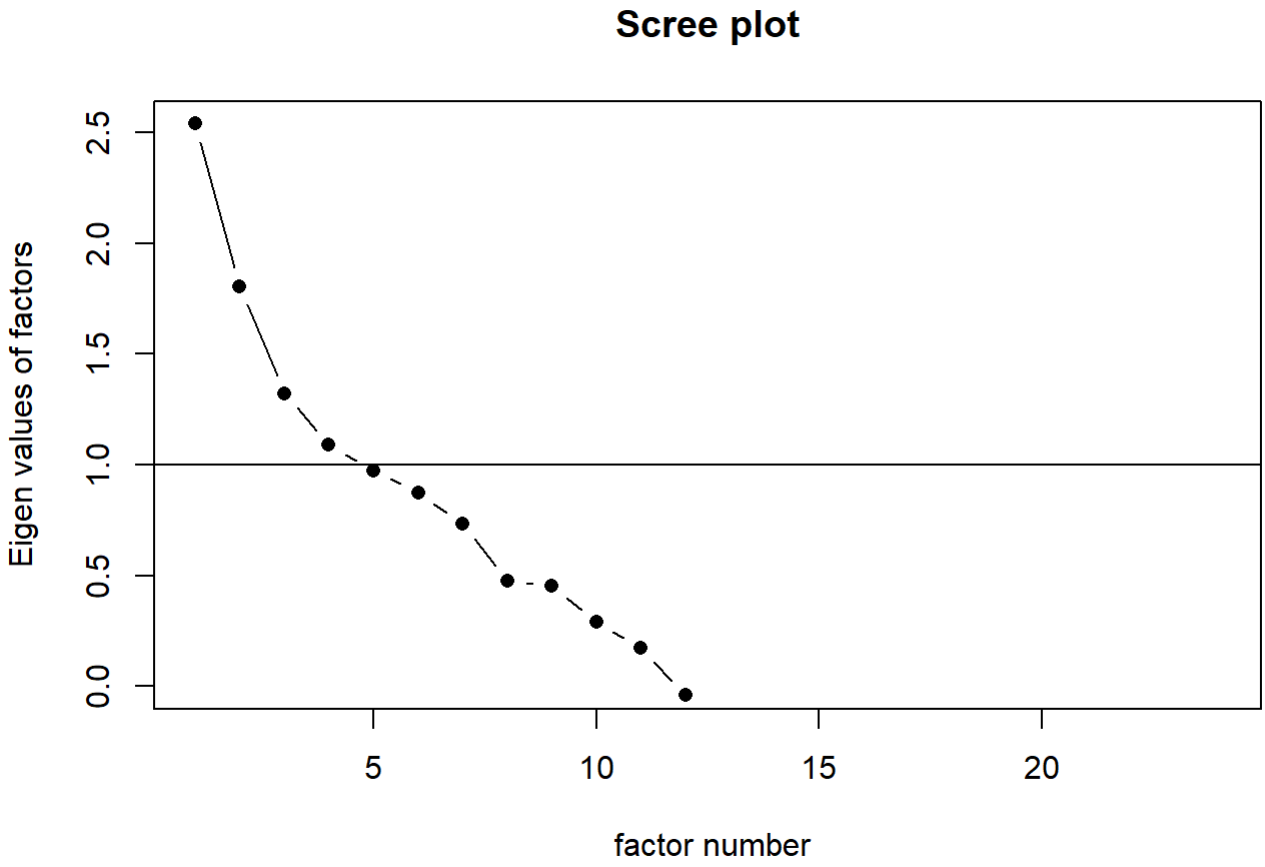


Light users

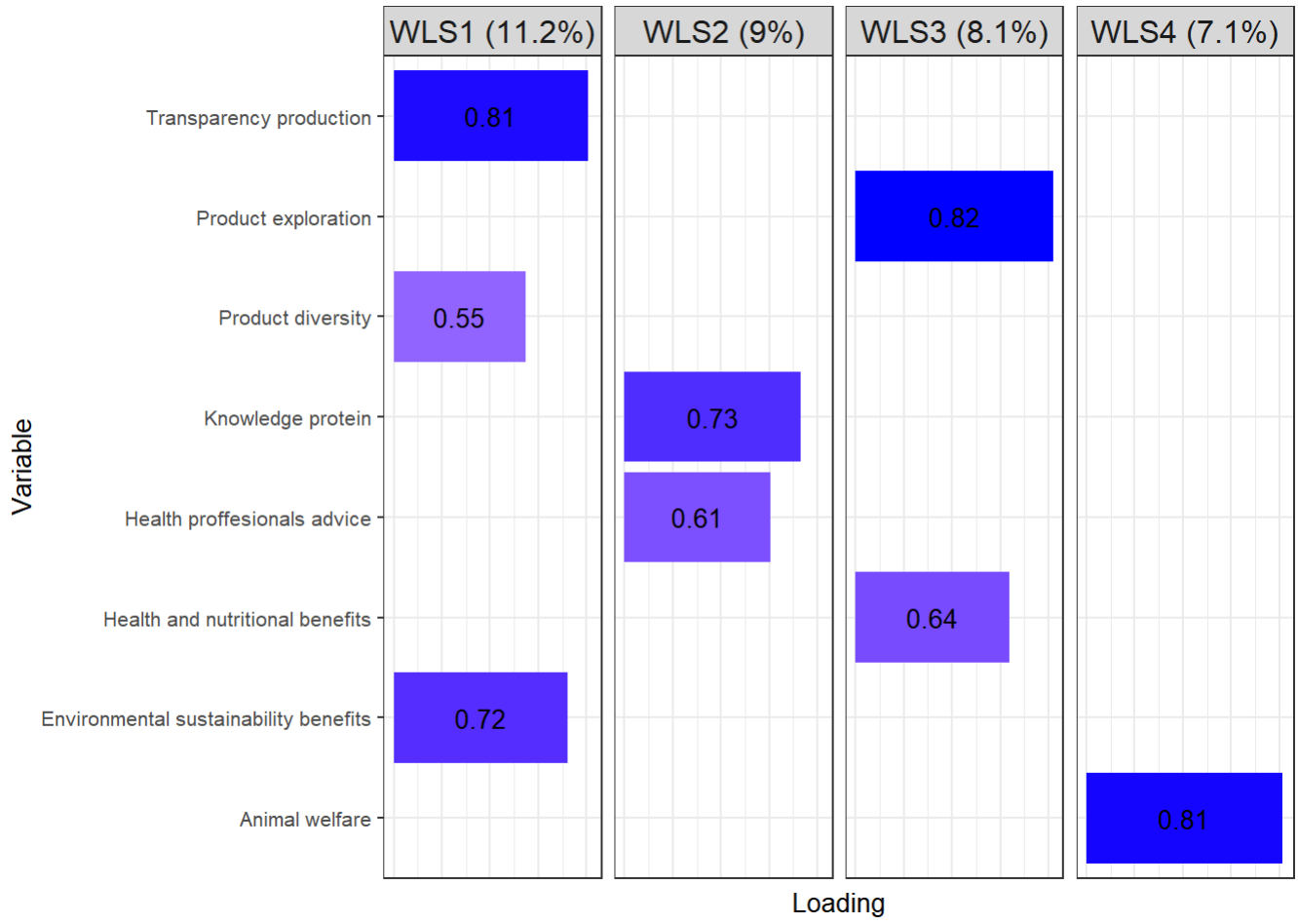
FA on tetrachoric correlations

- Numbers of factor determined with screeplot. Factor should explain more than one variable (eigenvalue > 1)
- Factor analysis with minimum residual for extraction and Variamx for rotation.
- Explained variance of total variance in

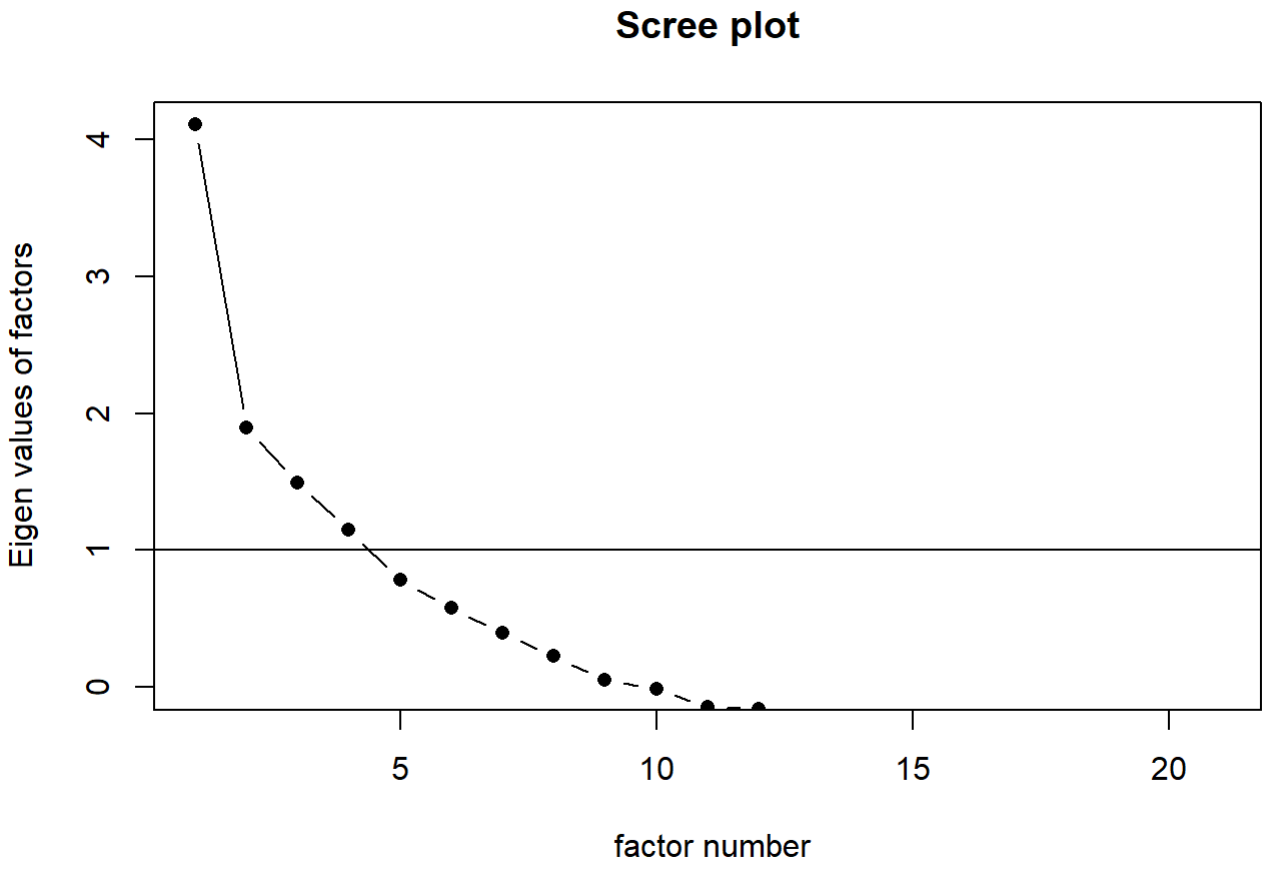
Drivers


Scree plot
Eigen values of factors
0.0
0.5
1.0
1.5
2.0
2.5
5
10
15
20
factor number

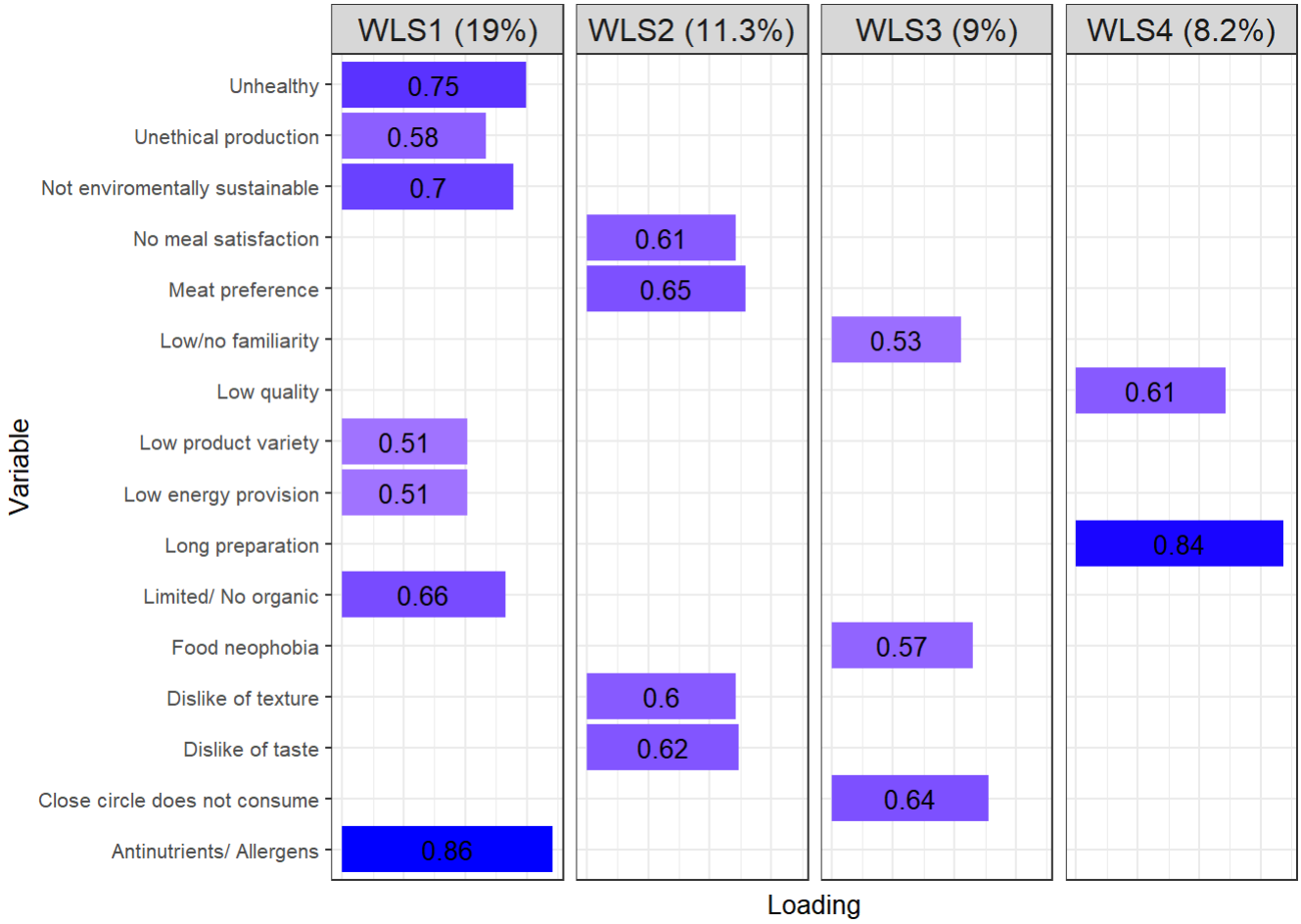
```
## Factor Analysis using method =  wls
## Call: fa(r = ., nfactors = 4, rotate = "varimax", fm = "wls")
## Standardized loadings (pattern matrix) based upon correlation matrix
##                                       WLS1  WLS2  WLS3  WLS4   h2   u2 com
## Health and nutritional benefits        0.06  0.03  0.64 -0.01 0.41 0.59 1.0
## Health proffesionals advice           -0.16  0.61  0.16  0.25 0.48 0.52 1.7
## Weight benefits                       -0.11  0.47 -0.02 -0.51 0.49 0.51 2.1
## Thriving physically                    0.04  0.32  0.12  0.01 0.12 0.88 1.3
## Environmental sustainability benefits  0.72 -0.07 -0.02  0.10 0.54 0.46 1.1
## Official dietary guidelines           -0.18  0.31 -0.17  0.02 0.16 0.84 2.3
## Animal welfare                         0.25  0.19  0.04  0.81 0.76 0.24 1.3
## Ethical production (fair trade)        0.50  0.17  0.00  0.21 0.32 0.68 1.6
## Minimal processing and high naturalness -0.05  0.07  0.08 -0.33 0.12 0.88 1.3
## Knowledge protein                      0.10  0.73 -0.32  0.07 0.66 0.34 1.4
## Local production                       0.48 -0.04  0.18 -0.32 0.37 0.63 2.1
## Transparency production                0.81  0.08 -0.12 -0.19 0.71 0.29 1.2
## Greater availability out               -0.07  0.47  0.23 -0.22 0.33 0.67 2.0
## Product diversity                      0.55  0.06  0.00 -0.02 0.30 0.70 1.0
## Improved taste                        -0.19 -0.39 -0.37  0.16 0.35 0.65 2.8
## Higher product quality                 0.19  0.01 -0.43  0.20 0.26 0.74 1.8
## Improved texture                      -0.21 -0.40  0.06  0.20 0.25 0.75 2.1
## Better convenience products           -0.07 -0.01  0.17  0.27 0.10 0.90 1.8
## Lower prices                           0.22  0.02  0.08 -0.27 0.13 0.87 2.1
## Knowledge recipes                     -0.25  0.20  0.00 -0.12 0.12 0.88 2.4
## Eating habits other people            -0.42  0.19  0.24 -0.25 0.34 0.66 2.8
## Diet variation                         0.07  0.14  0.40  0.14 0.21 0.79 1.6
## Product exploration                   -0.10 -0.14  0.82  0.01 0.70 0.30 1.1
## Trend / lifestyle / popularity        -0.39  0.32 -0.01 -0.04 0.25 0.75 1.9
##
##                        WLS1 WLS2 WLS3 WLS4
## SS loadings            2.69 2.16 1.95 1.69
## Proportion Var         0.11 0.09 0.08 0.07
## Cumulative Var         0.11 0.20 0.28 0.35
## Proportion Explained   0.32 0.25 0.23 0.20
## Cumulative Proportion 0.32 0.57 0.80 1.00
##
## Mean item complexity =  1.7
## Test of the hypothesis that 4 factors are sufficient.
##
## df null model =  276  with the objective function =  97.48
## df of  the model are 186  and the objective function was  93.46
##
## The root mean square of the residuals (RMSR) is  0.12
## The df corrected root mean square of the residuals is  0.15
##
## Fit based upon off diagonal values = 0.59
## Measures of factor score adequacy
##                                                 WLS1 WLS2 WLS3 WLS4
## Correlation of (regression) scores with factors   0.97 0.92 0.93 0.95
## Multiple R square of scores with factors          0.94 0.84 0.86 0.90
## Minimum correlation of possible factor scores     0.87 0.69 0.73 0.81
```


WLS1 (11.2%)
WLS2 (9%)
WLS3 (8.1%)
WLS4 (7.1%)
Transparency production
Product exploration
Product diversity
Knowledge protein
Health proffesionals advice
Health and nutritional benefits
Environmental sustainability benefits
Animal welfare
0.81
0.82
0.55
0.73
0.61
0.64
0.72
0.81
Variable
Loading

Barriers


Scree plot
Eigen values of factors
0
1
2
3
4
5
10
15
20
factor number

```
## Factor Analysis using method =  wls
## Call: fa(r = ., nfactors = 4, rotate = "varimax", fm = "wls")
## Standardized loadings (pattern matrix) based upon correlation matrix
##                                 WLS1  WLS2  WLS3  WLS4   h2   u2 com
## Low product variety              0.51 -0.31  0.08  0.28 0.44 0.56 2.4
## Low quality                      0.46 -0.21  0.01  0.61 0.62 0.38 2.1
## Limited/ No organic              0.66 -0.38  0.17  0.00 0.61 0.39 1.7
## Nutritional deficiencies         0.39  0.50  0.00  0.28 0.47 0.53 2.5
## Low value for money              0.50  0.14 -0.12  0.28 0.36 0.64 1.9
## Dislike of taste                -0.20  0.62 -0.17 -0.19 0.49 0.51 1.6
## Dislike of texture              -0.18  0.60 -0.07 -0.25 0.46 0.54 1.5
## Close circle does not consume    0.00  0.03  0.64  0.00 0.41 0.59 1.0
## Low knowledge on preparation    -0.23 -0.02  0.48  0.31 0.38 0.62 2.2
## Long preparation                -0.08  0.09  0.00  0.84 0.72 0.28 1.0
## No local production              0.17 -0.03  0.44  0.19 0.26 0.74 1.7
## Antinutrients/ Allergens         0.86 -0.12 -0.07 -0.06 0.75 0.25 1.1
## Not enviromentally sustainable   0.70 -0.28 -0.29 -0.01 0.65 0.35 1.7
## Food neophobia                   0.04  0.13  0.57 -0.22 0.40 0.60 1.4
## Low/no familiarity              -0.20  0.07  0.53 -0.06 0.32 0.68 1.3
## Unhealthy                        0.75  0.32  0.11  0.01 0.68 0.32 1.4
## No meal satisfaction            -0.03  0.61  0.22  0.16 0.44 0.56 1.4
## Meat preference                  0.03  0.65  0.19  0.09 0.46 0.54 1.2
## Discomfort after consumption     0.34  0.19 -0.27 -0.06 0.23 0.77 2.6
## Low energy provision             0.51 -0.13  0.33 -0.29 0.47 0.53 2.5
## Unethical production             0.58 -0.04 -0.09  0.08 0.36 0.64 1.1
##
##                        WLS1 WLS2 WLS3 WLS4
## SS loadings            3.99 2.37 1.90 1.72
## Proportion Var         0.19 0.11 0.09 0.08
## Cumulative Var         0.19 0.30 0.39 0.48
## Proportion Explained   0.40 0.24 0.19 0.17
## Cumulative Proportion 0.40 0.64 0.83 1.00
##
## Mean item complexity =  1.7
## Test of the hypothesis that 4 factors are sufficient.
##
## df null model =  210  with the objective function =  97.39
## df of  the model are 132  and the objective function was  90.19
##
## The root mean square of the residuals (RMSR) is  0.1
## The df corrected root mean square of the residuals is  0.13
##
## Fit based upon off diagonal values = 0.84
## Measures of factor score adequacy
##                                                  WLS1 WLS2 WLS3 WLS4
## Correlation of (regression) scores with factors   0.95 0.91 0.90 0.90
## Multiple R square of scores with factors          0.91 0.83 0.80 0.82
## Minimum correlation of possible factor scores     0.81 0.66 0.61 0.64
```


WLS1 (19%)
WLS2 (11.3%)
WLS3 (9%)
WLS4 (8.2%)
Unhealthy
Unethical production
Not enviromentally sustainable
No meal satisfaction
Meat preference
Low/no familiarity
Low quality
Low product variety
Low energy provision
Long preparation
Limited/ No organic
Food neophobia
Dislike of texture
Dislike of taste
Close circle does not consume
Antinutrients/ Allergens
0.75
0.58
0.7
0.61
0.65
0.53
0.61
0.51
0.51
0.84
0.66
0.57
0.6
0.62
0.64
0.86
Variable
Loading