

Multiple Factor Analysis (MFA) with FactoMineR on the sensory description of the 3 juries

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Import data

```
wine <- read.table("data_MFA_WineJurys.csv", header=TRUE, sep=";", check.names=FALSE,
  row.names=1, fileEncoding="latin1")
```

header=TRUE : indicates that the file contains the names of the variables

sep=";" : indicates the fields separator (usually ";" or "," for csv files)

row.names=1 : indicates the column of the table which contains the row names

It is important to check that the import is well done

```
summary(wine)
```

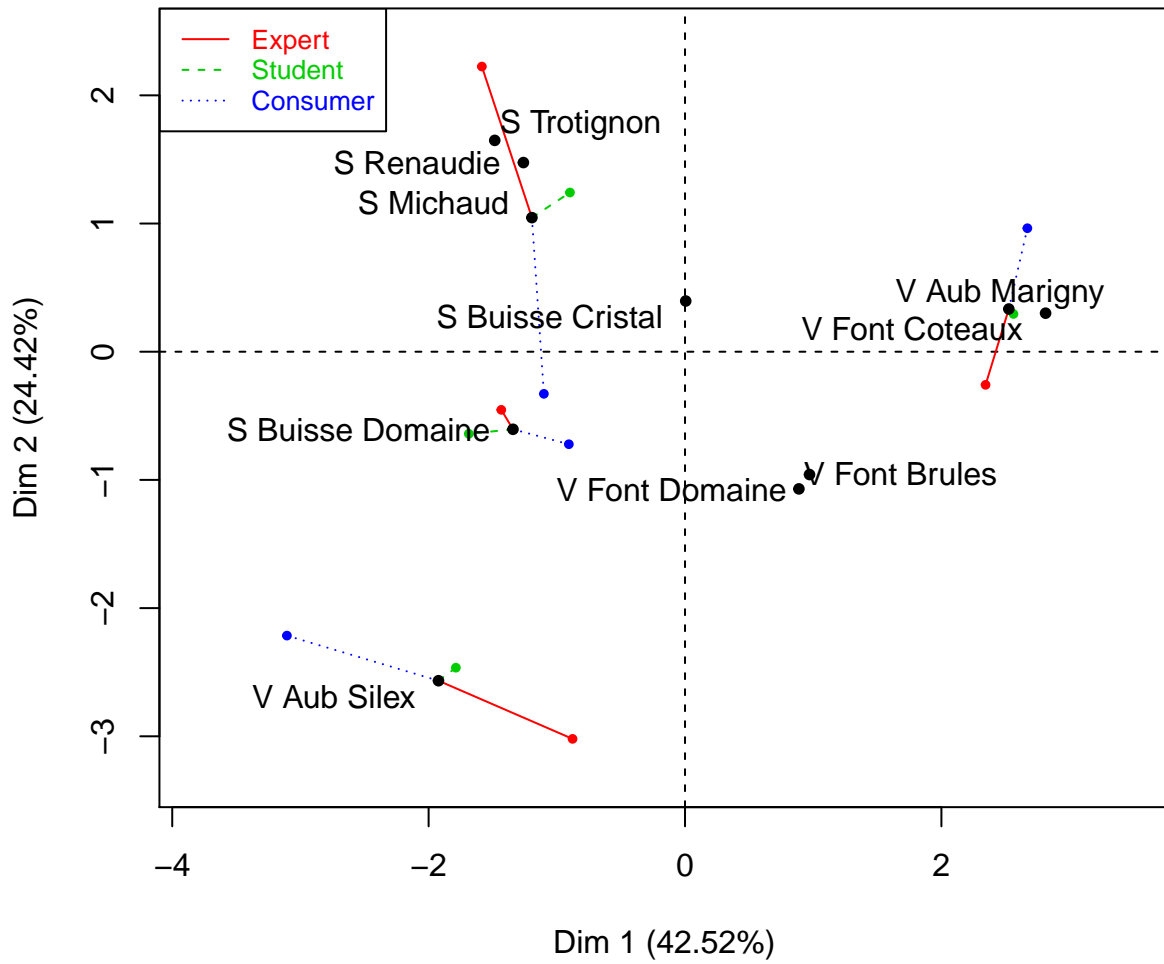
Loading FactoMineR

```
library(FactoMineR)
```

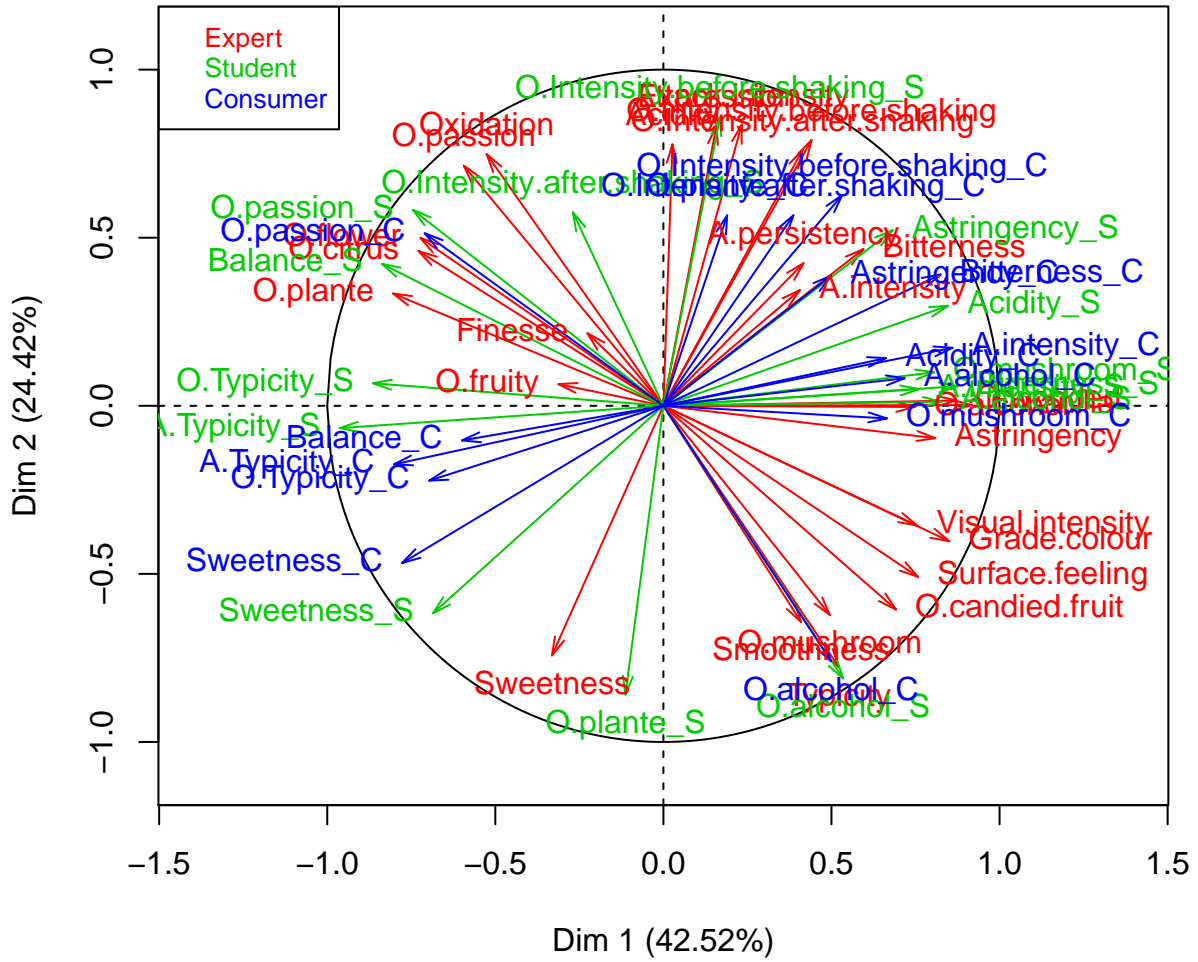
MFA without supplementary groups

```
res <- MFA(wine[,2:58], group=c(27,15,15), type=rep("s",3),
  name.group=c("Expert", "Student", "Consumer"))
```

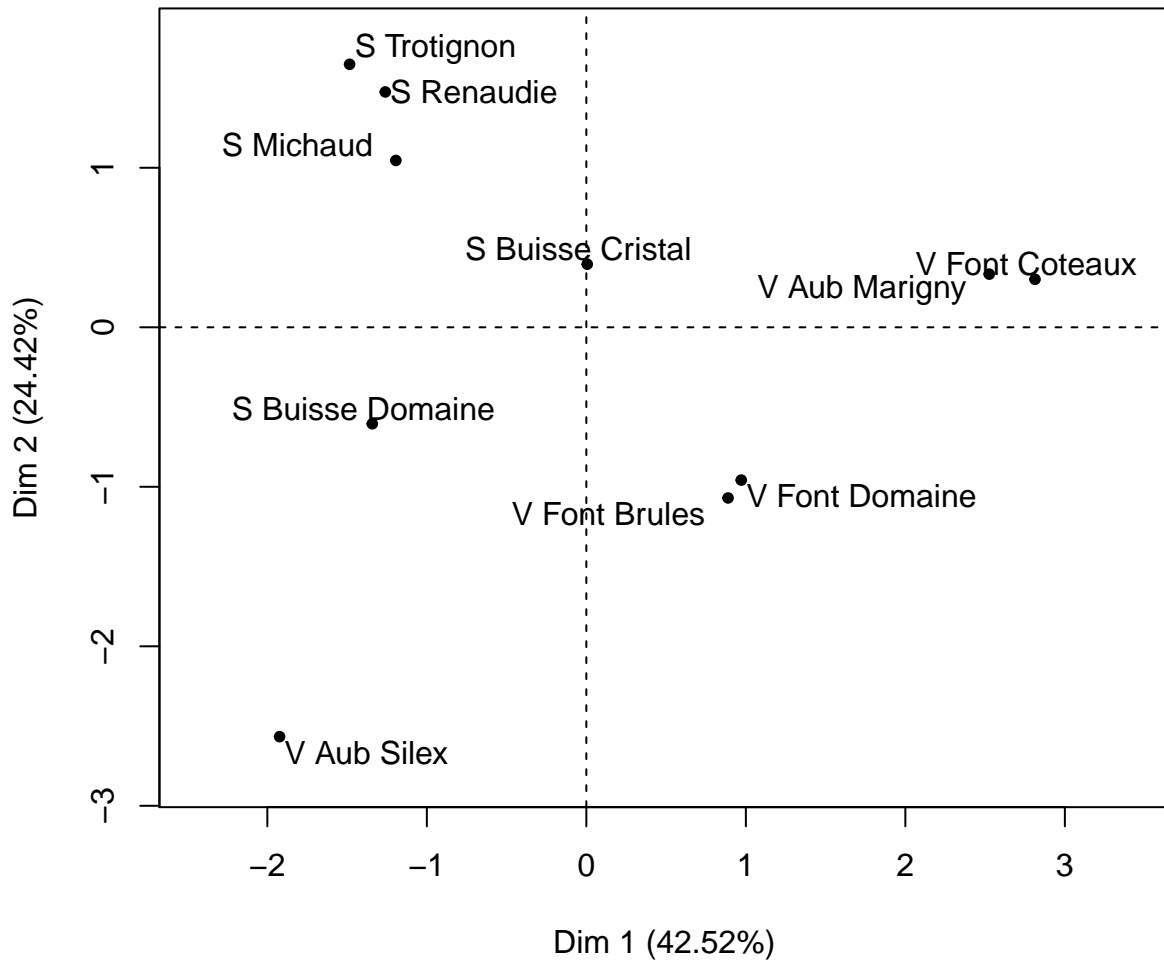

Individual factor map



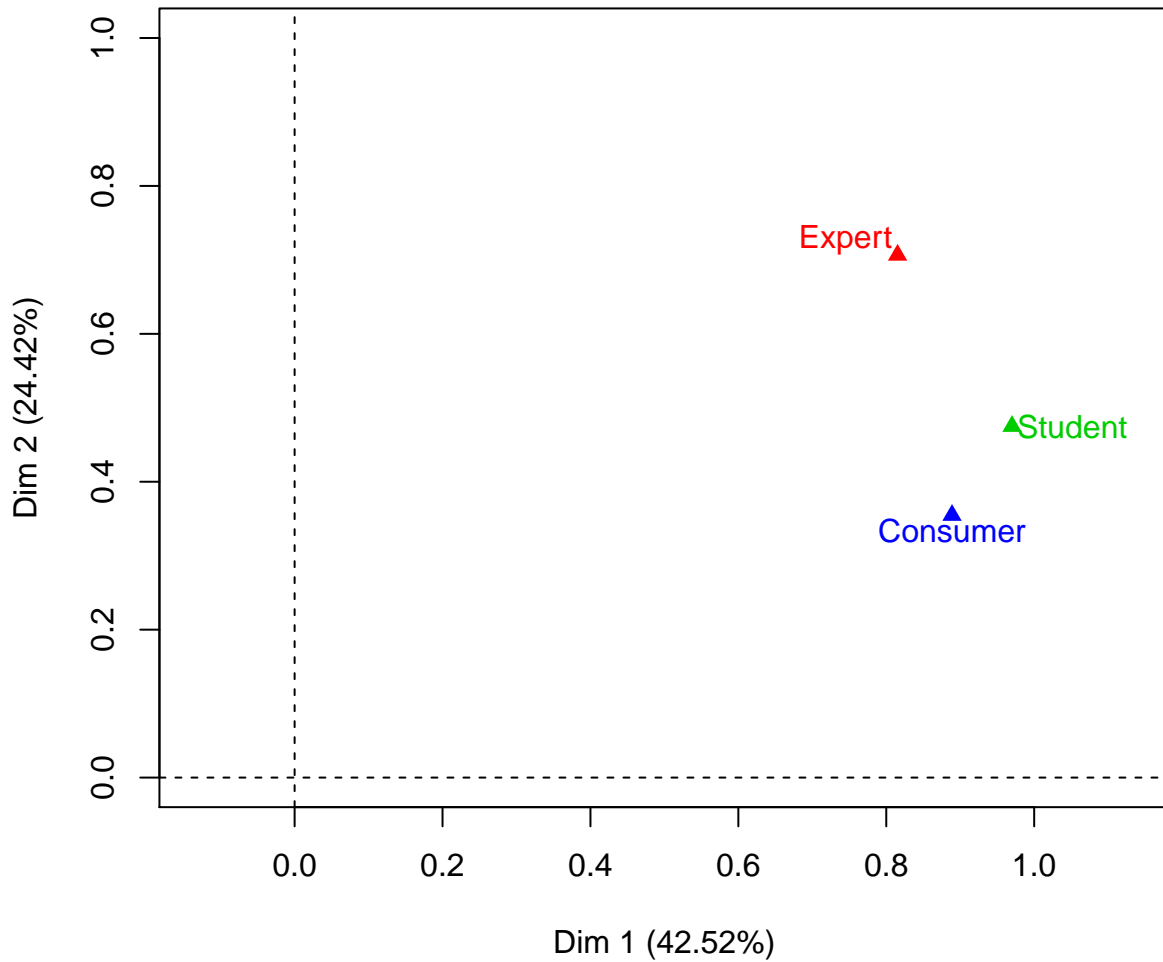
Correlation circle



Individual factor map



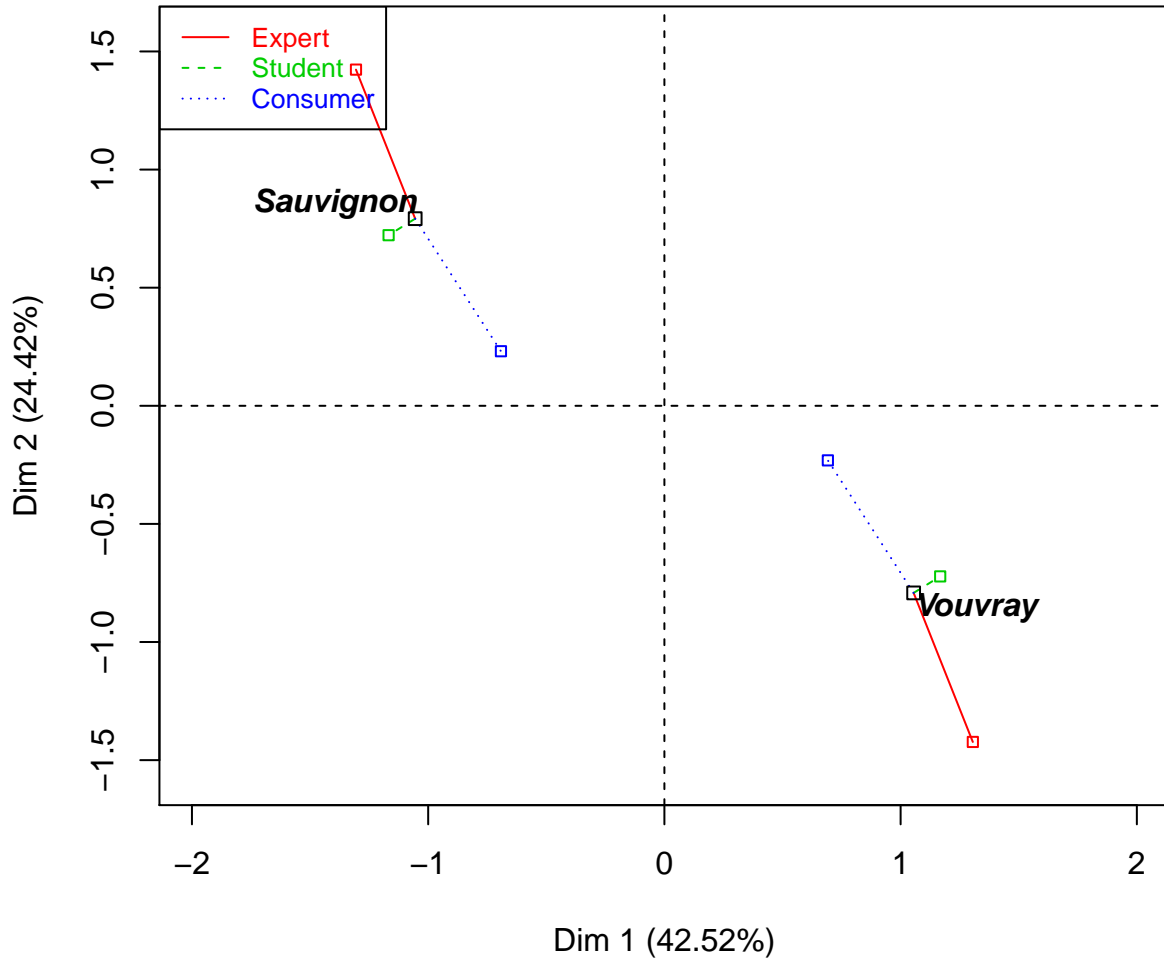
Groups representation



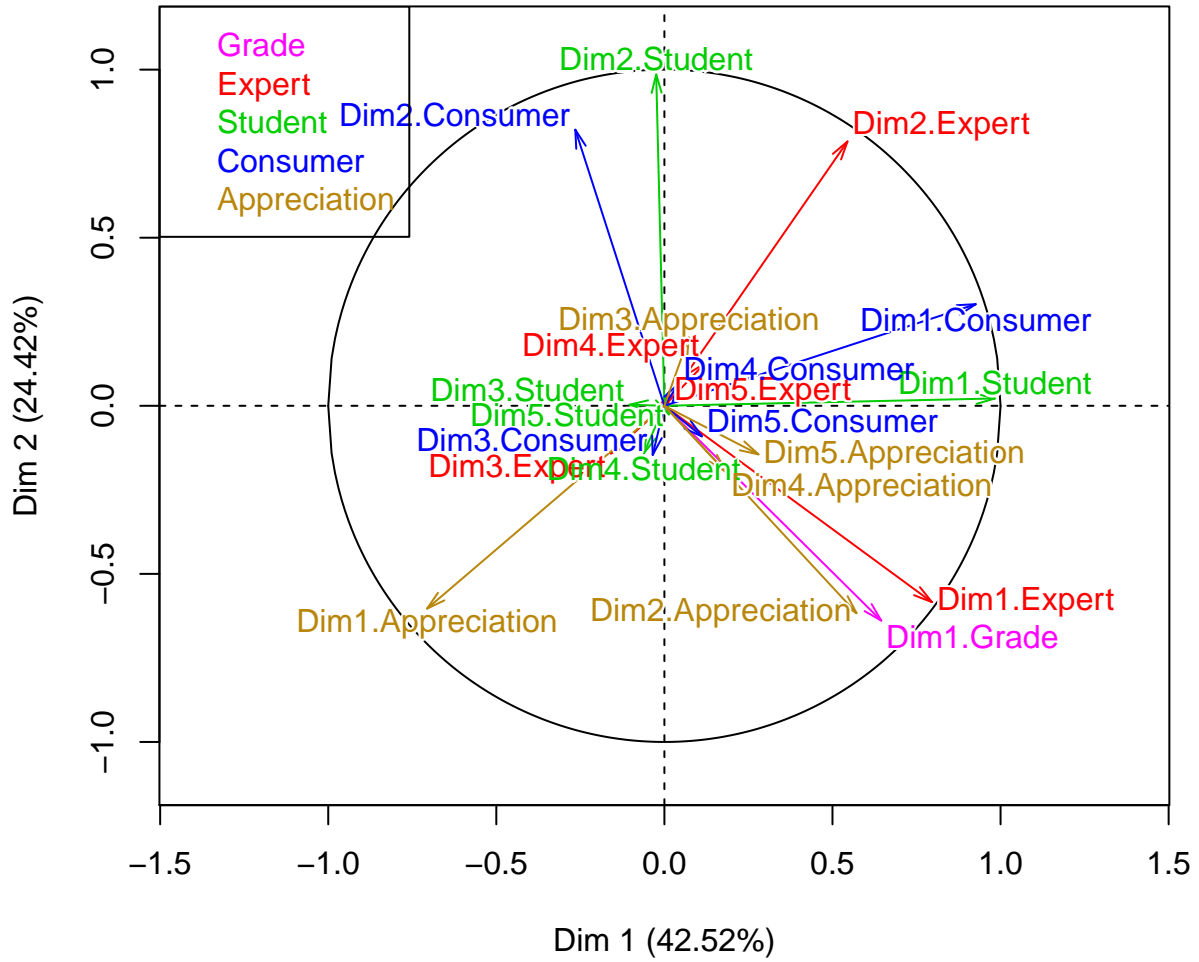
MFA with supplementary groups

```
res <- MFA(wine, group=c(1,27,15,15,60), type=c("n",rep("s",4)), num.group.sup=c(1,5),  
          name.group=c("Grade","Expert","Student","Consumer","Appreciation"))
```

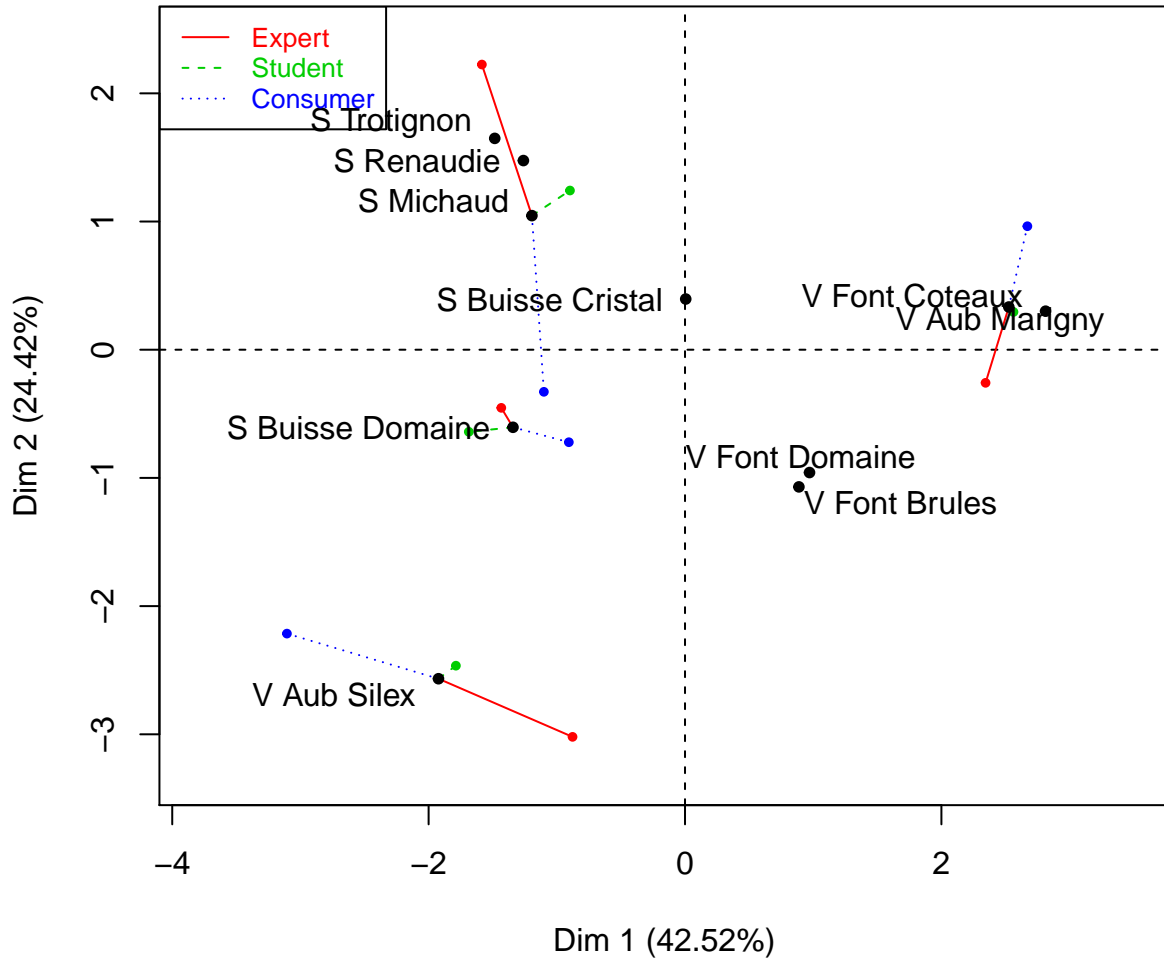
Individual factor map



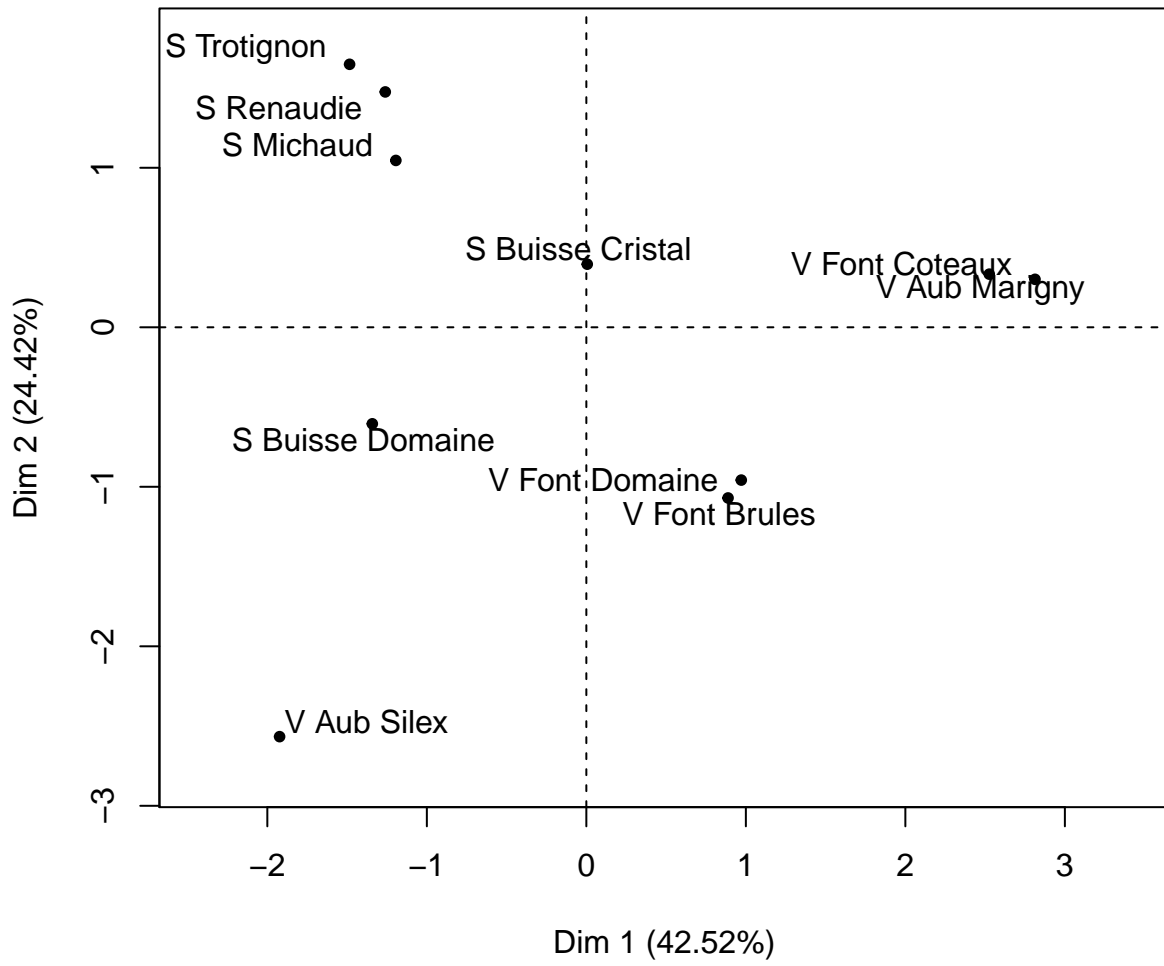
Partial axes



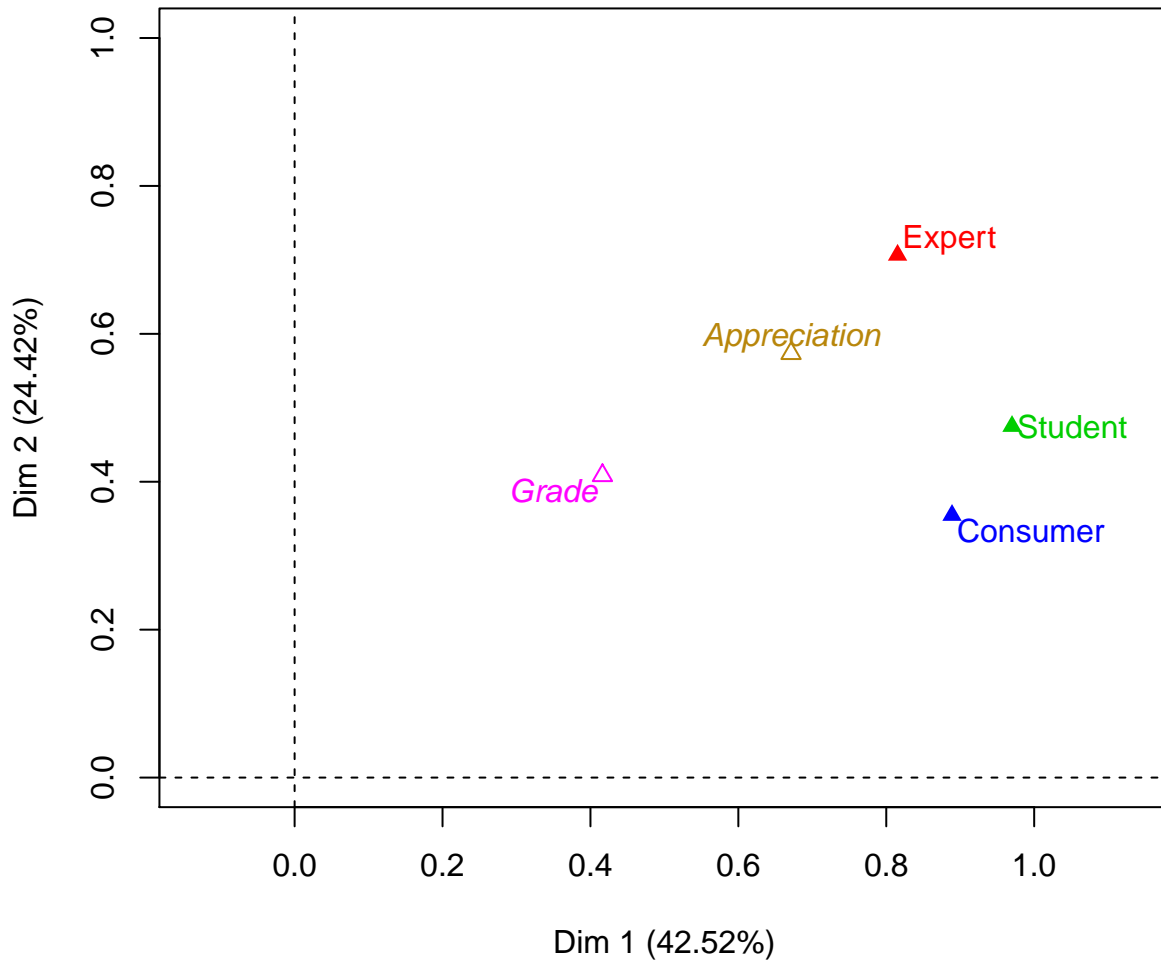
Individual factor map



Individual factor map



Groups representation



A summary of the main results with the `summary.MFA` function

```
summary(res)
```

The results are given on the first 2 dimensions

```
summary(res, ncp=2)
```

```
##
## Call:
## MFA(base = wine, group = c(1, 27, 15, 15, 60), type = c("n",
##     rep("s", 4)), name.group = c("Grade", "Expert", "Student",
##     "Consumer", "Appreciation"), num.group.sup = c(1, 5))
##
##
## Eigenvalues
##           Dim.1   Dim.2   Dim.3   Dim.4   Dim.5   Dim.6
## Variance      2.674   1.536   0.578   0.442   0.319   0.274
## % of var.     42.515  24.423   9.196   7.020   5.075   4.362
```

```

## Cumulative % of var. 42.515 66.939 76.135 83.155 88.230 92.592
##                               Dim.7  Dim.8  Dim.9
## Variance                    0.235  0.135  0.096
## % of var.                    3.740  2.146  1.523
## Cumulative % of var. 96.331 98.477 100.000
##
## Groups
##                               Dim.1  ctr  cos2  Dim.2  ctr  cos2
## Expert                       | 0.815 30.486 0.459 | 0.706 45.989 0.345 |
## Student                       | 0.970 36.273 0.728 | 0.475 30.920 0.174 |
## Consumer                       | 0.889 33.240 0.634 | 0.355 23.091 0.101 |
##
## Supplementary groups
##                               Dim.1  cos2  Dim.2  cos2
## Grade                         | 0.416 0.173 | 0.408 0.167 |
## Appreciation                 | 0.671 0.307 | 0.573 0.224 |
##
## Individuals
##                               Dim.1  ctr  cos2  Dim.2  ctr  cos2
## S Michaud                     | -1.194 5.333 0.276 | 1.046 7.122 0.212 |
## S Renaudie                     | -1.261 5.942 0.346 | 1.476 14.173 0.474 |
## S Trotignon                    | -1.484 8.238 0.350 | 1.649 17.692 0.432 |
## S Buisse Domaine               | -1.342 6.733 0.392 | -0.605 2.384 0.080 |
## S Buisse Cristal              | 0.006 0.000 0.000 | 0.395 1.018 0.046 |
## V Aub Silex                   | -1.923 13.831 0.309 | -2.566 42.873 0.550 |
## V Aub Marigny                 | 2.526 23.857 0.746 | 0.333 0.723 0.013 |
## V Font Domaine                | 0.971 3.528 0.240 | -0.958 5.975 0.234 |
## V Font Brules                 | 0.888 2.952 0.168 | -1.070 7.453 0.244 |
## V Font Coteaux                | 2.813 29.586 0.815 | 0.301 0.589 0.009 |
##
## Continuous variables (the 10 first)
##                               Dim.1  ctr  cos2  Dim.2  ctr  cos2
## O.Intensity.before.shaking    | 0.441 0.619 0.194 | 0.791 3.469 0.626 |
## O.Intensity.after.shaking     | 0.414 0.546 0.171 | 0.761 3.215 0.580 |
## Expression                     | 0.158 0.079 0.025 | 0.833 3.843 0.693 |
## O.fruity                       | -0.312 0.310 0.097 | 0.064 0.023 0.004 |
## O.passion                      | -0.594 1.123 0.353 | 0.714 2.830 0.510 |
## O.citrus                       | -0.728 1.690 0.531 | 0.460 1.175 0.212 |
## O.candied.fruit               | 0.692 1.526 0.479 | -0.606 2.037 0.367 |
## O.vanilla                     | 0.918 2.684 0.843 | 0.002 0.000 0.000 |
## O.wooded                      | 0.871 2.414 0.758 | 0.016 0.001 0.000 |
## O.mushroom                    | 0.495 0.781 0.245 | -0.622 2.147 0.387 |
##
## Supplementary continuous variables (the 10 first)
##                               Dim.1  cos2  Dim.2  cos2
## Judge1                         | -0.595 0.354 | -0.196 0.039 |
## Judge2                         | -0.683 0.466 | -0.061 0.004 |
## Judge3                         | -0.461 0.212 | -0.515 0.265 |
## Judge4                         | -0.461 0.213 | -0.591 0.349 |
## Judge5                         | -0.842 0.709 | 0.232 0.054 |
## Judge6                         | -0.485 0.236 | -0.555 0.308 |
## Judge7                         | -0.790 0.624 | 0.061 0.004 |
## Judge8                         | -0.568 0.322 | -0.500 0.250 |
## Judge9                         | -0.430 0.185 | -0.518 0.269 |

```

```
## Judge10          | -0.158  0.025 | -0.400  0.160 |
##
## Supplementary categories
##                Dim.1  cos2 v.test   Dim.2  cos2 v.test
## Sauvignon      | -1.055  0.619 -1.936 |  0.792  0.349  1.917 |
## Vouvray        |  1.055  0.619  1.936 | -0.792  0.349 -1.917 |
```

Description of dimensions

```
dimdesc(res)
```

```
## $Dim.1
## $Dim.1$quanti
##          correlation      p.value
## O.vanilla      0.9180053 1.789512e-04
## Bitterness_S  0.8754625 9.031357e-04
## O.wooded       0.8705820 1.046802e-03
## A.intensity_C  0.8601281 1.409540e-03
## Grade.colour   0.8503861 1.822568e-03
## Acidity_S      0.8470873 1.980394e-03
## A.alcohol_S    0.8271634 3.151248e-03
## Bitterness_C  0.8250258 3.301005e-03
## Astringency    0.8089567 4.595223e-03
## O.mushroom_S   0.8051341 4.949713e-03
## A.intensity_S  0.7602835 1.069186e-02
## Surface.feeling 0.7572620 1.119663e-02
## Visual.intensity 0.7548613 1.160943e-02
## O.alcohol      0.7478908 1.286845e-02
## A.alcohol_C    0.7177895 1.941324e-02
## O.candied.fruit 0.6921134 2.656995e-02
## Astringency_S  0.6822724 2.973487e-02
## O.mushroom_C   0.6650226 3.588551e-02
## Acidity_C      0.6624159 3.688412e-02
## Judge42        -0.6416612 4.551145e-02
## Judge38        -0.6569470 3.903985e-02
## Judge2         -0.6828965 2.952688e-02
## Sweetness_S    -0.6854789 2.867685e-02
## Judge34        -0.6877053 2.795755e-02
## Judge43        -0.6924169 2.647618e-02
## O.Typicity_C   -0.6965382 2.522524e-02
## O.passion_C    -0.7099740 2.142940e-02
## Judge36        -0.7192003 1.906383e-02
## O.flower       -0.7226338 1.823174e-02
## O.citrus       -0.7284487 1.688052e-02
## Judge52        -0.7391772 1.457296e-02
## O.passion_S    -0.7449419 1.342875e-02
## Judge15        -0.7723332 8.837330e-03
## Sweetness_C    -0.7774822 8.119017e-03
## Judge41        -0.7864907 6.963219e-03
## Judge7         -0.7896491 6.587242e-03
## Judge54        -0.7900882 6.536132e-03
## Judge33        -0.7983074 5.630702e-03
```

```

## A.Typicity_C      -0.8015348 5.300950e-03
## O.plante          -0.8043599 5.023815e-03
## Balance_S        -0.8373639 2.503049e-03
## Judge5           -0.8420768 2.238683e-03
## Judge12          -0.8520804 1.745150e-03
## O.Typicity_S     -0.8635940 1.280537e-03
## Judge28          -0.8666650 1.173595e-03
## A.Typicity_S     -0.9631579 7.709429e-06
##
## $Dim.1$quali
##                R2      p.value
## Grade.variety 0.4162427 0.04396733
##
## $Dim.1$category
##      Estimate      p.value
## Vouvray    1.055053 0.04396733
## Sauvignon -1.055053 0.04396733
##
##
## $Dim.2
## $Dim.2$quanti
##                correlation      p.value
## O.Intensity.before.shaking_S  0.8583613 0.0014788140
## Attack.intensity              0.8361078 0.0025771395
## Expression                    0.8325037 0.0027985108
## O.Intensity.before.shaking    0.7909433 0.0064374270
## Acidity                      0.7778850 0.0080646316
## O.Intensity.after.shaking     0.7614464 0.0105019234
## Oxidation                    0.7485140 0.0127521757
## O.passion                    0.7144167 0.0202664554
## Judge59                      -0.6366331 0.0477876587
## Smoothness                   -0.6429580 0.0449364374
## Judge39                      -0.6515434 0.0412516287
## Judge32                      -0.7095362 0.0215464288
## Judge31                      -0.7147550 0.0201797273
## Judge55                      -0.7282762 0.0169195725
## Sweetness                    -0.7426496 0.0138759256
## Judge11                      -0.7495039 0.0125689860
## Judge47                      -0.7496185 0.0125478913
## O.alcohol_C                  -0.7598661 0.0107606118
## Judge53                      -0.7739151 0.0086120596
## Typicity                     -0.7776886 0.0080911119
## Judge45                      -0.7786909 0.0079565839
## Judge13                      -0.8019058 0.0052639562
## O.alcohol_S                  -0.8114153 0.0043770479
## O.plante_S                   -0.8592377 0.0014441519
## Judge17                      -0.8792081 0.0008030583
##
##
## $Dim.2$quali
##                R2      p.value
## Grade.variety 0.4084123 0.04667455
##
## $Dim.2$category
##      Estimate      p.value

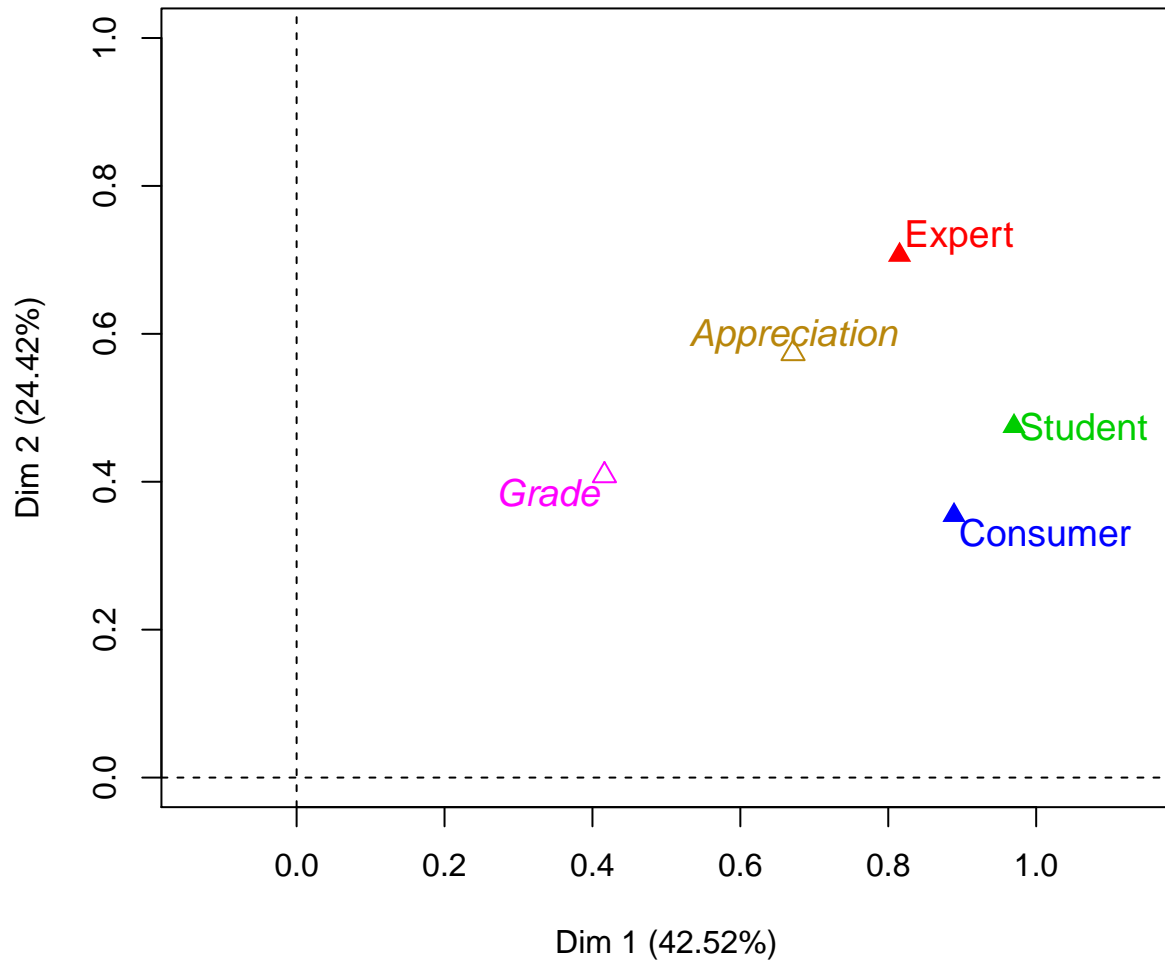
```

```
## Sauvignon 0.7920973 0.04667455
## Vouvray -0.7920973 0.04667455
##
##
## $Dim.3
## $Dim.3$quanti
## correlation p.value
## Judge30 0.6879043 0.02789385
## Judge50 0.6580019 0.03861759
## 0.Intensity.after.shaking_S 0.6444709 0.04427171
## Judge37 -0.6825615 0.02963838
## 0.fruity -0.6874806 0.02802958
```

Graph of the groups of variables

```
plot(res,choix="group",cex=1.2)
```

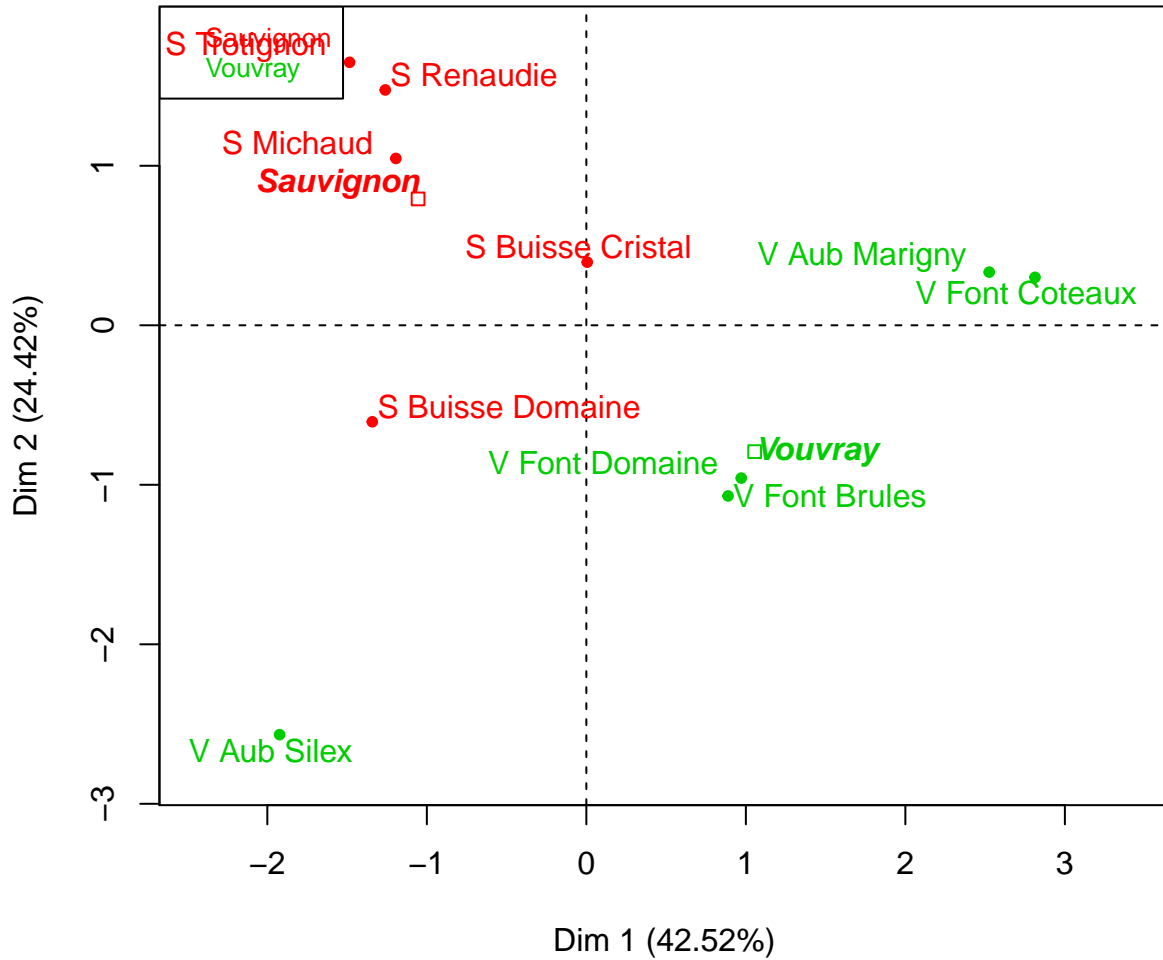

Groups representation



Graph of the individuals

```
plot(res, habillage=1)
```

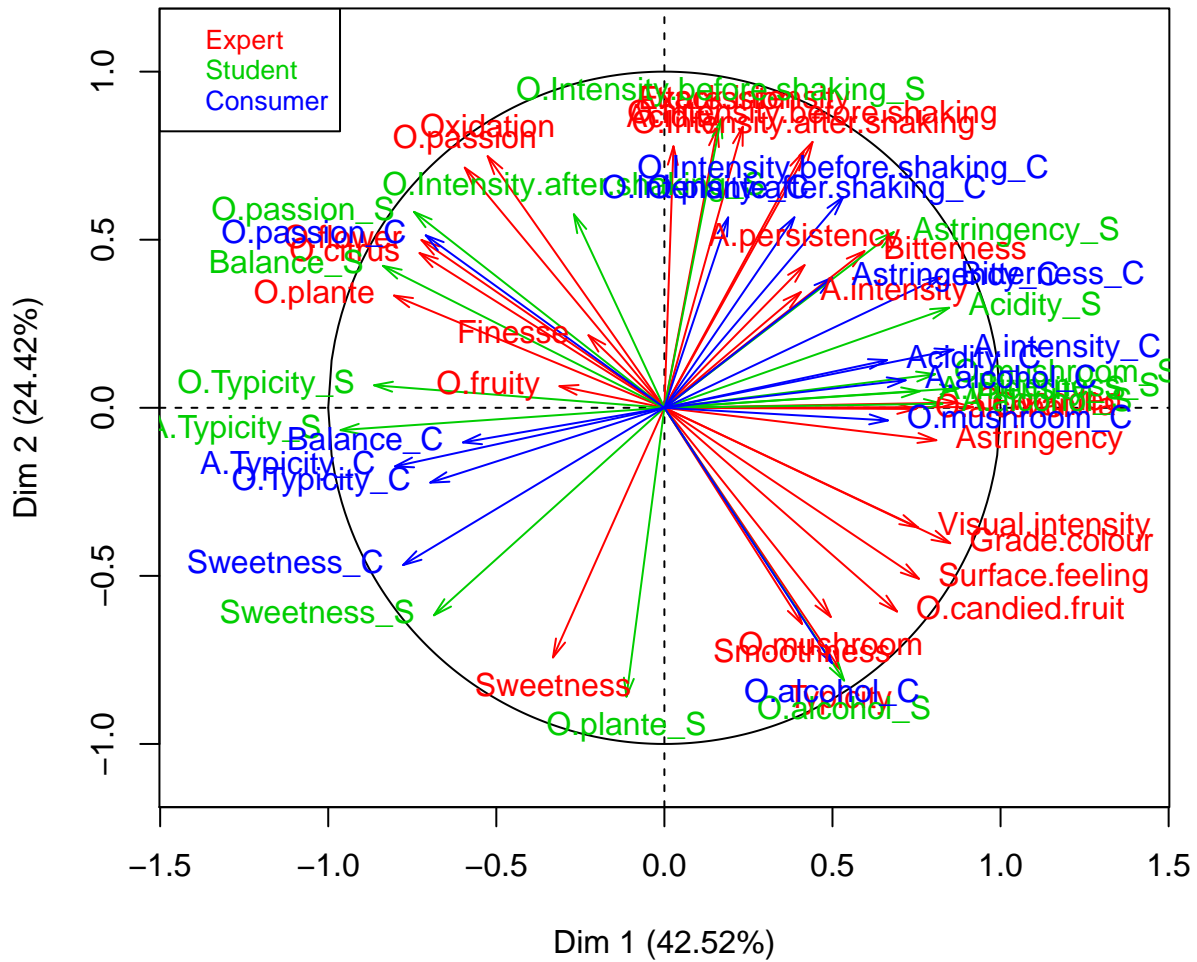
Individual factor map



Graph of the variables

```
plot(res,choix="var", invisible="quanti.sup", title="Graph of the active variables")
```

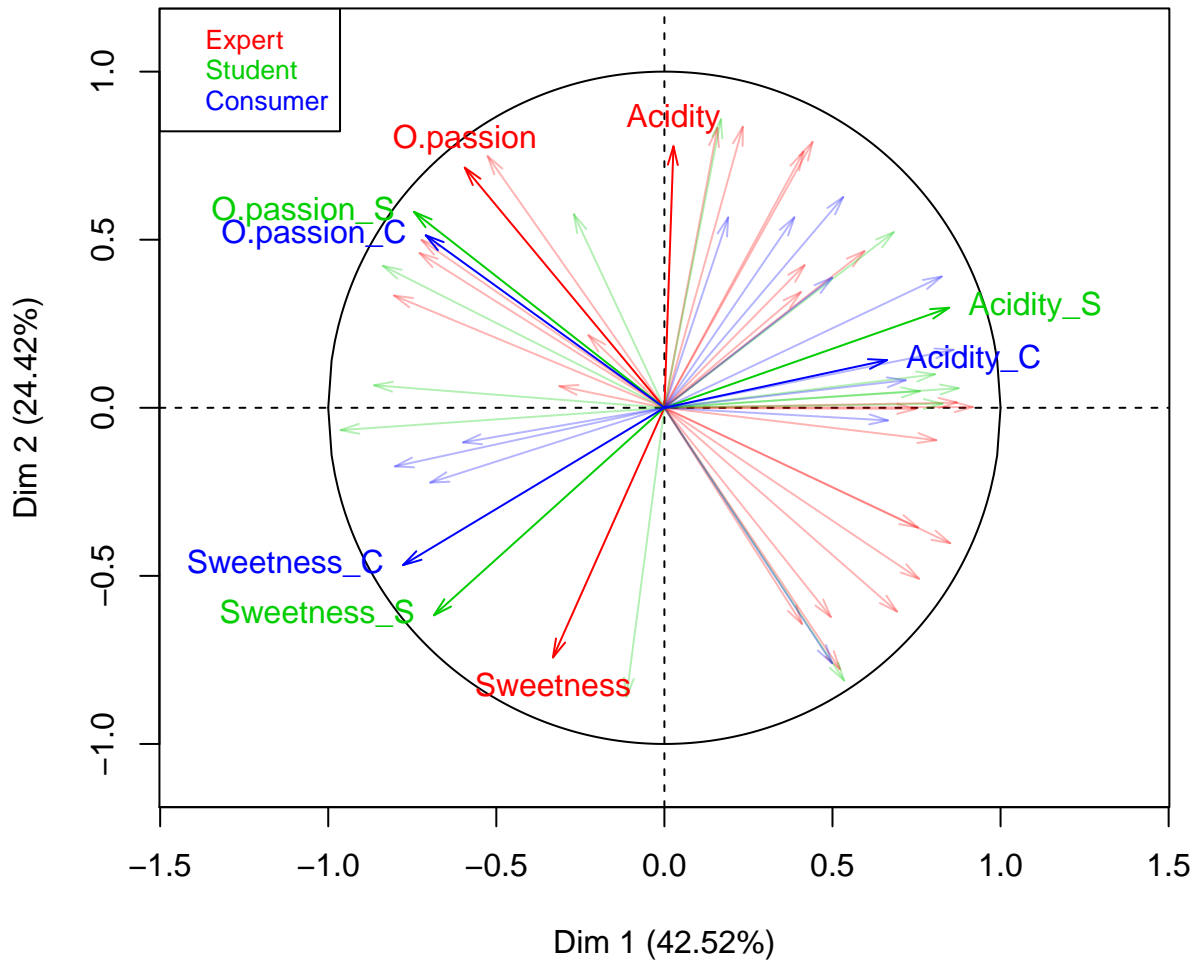
Graph of the active variables



Graph with variables selection

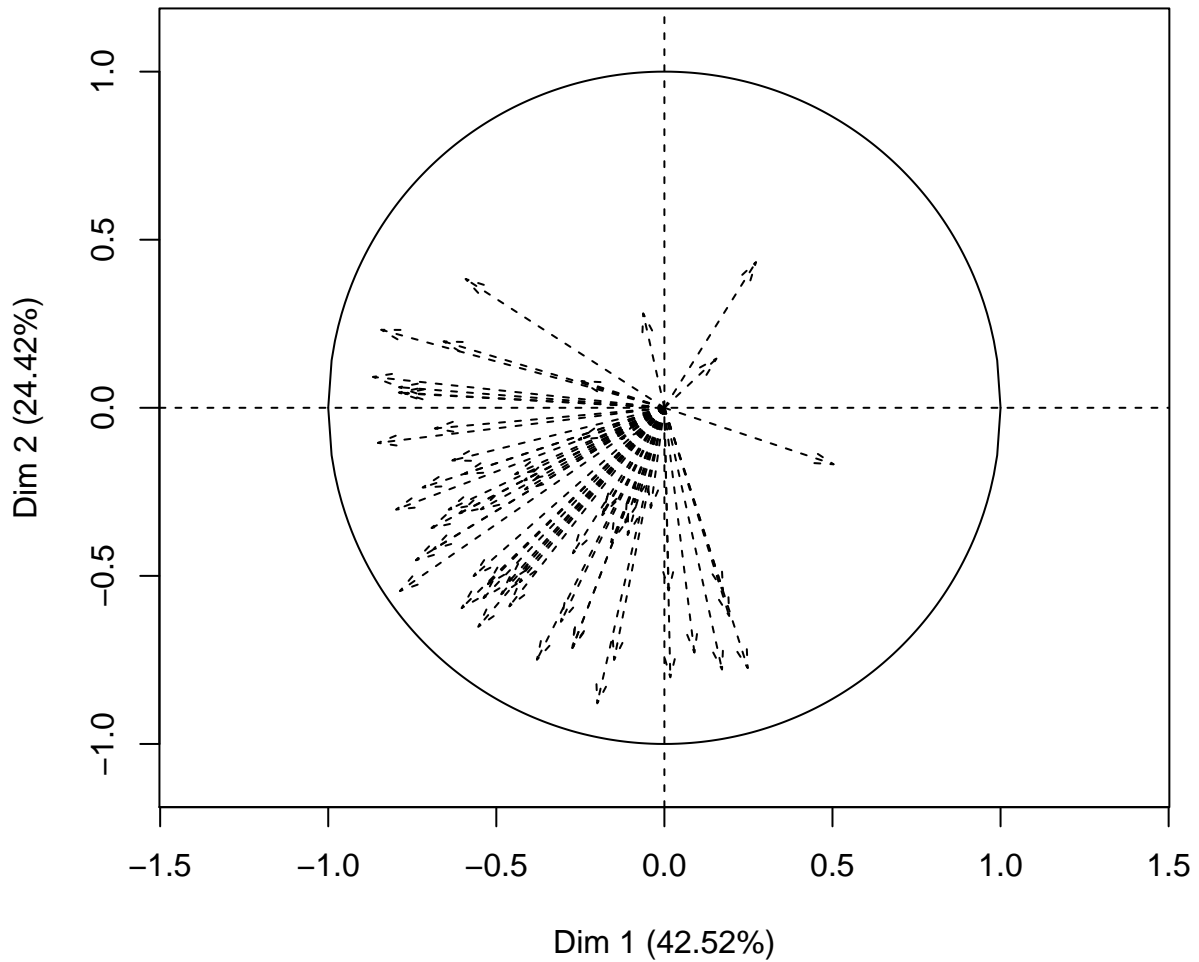
```
selection = c(grep("passion",rownames(res$quanti.var$coord),fixed=TRUE),
  grep("Acidity",rownames(res$quanti.var$coord),fixed=TRUE),
  grep("Sweetness",rownames(res$quanti.var$coord),fixed=TRUE))
plot(res,choix="var",select=selection,invisible="quanti.sup")
```

Correlation circle



```
plot(res,choix="var", invisible="quanti", habillage="none", lab.var=FALSE,  
      title="Graph of the supplementary variables")
```

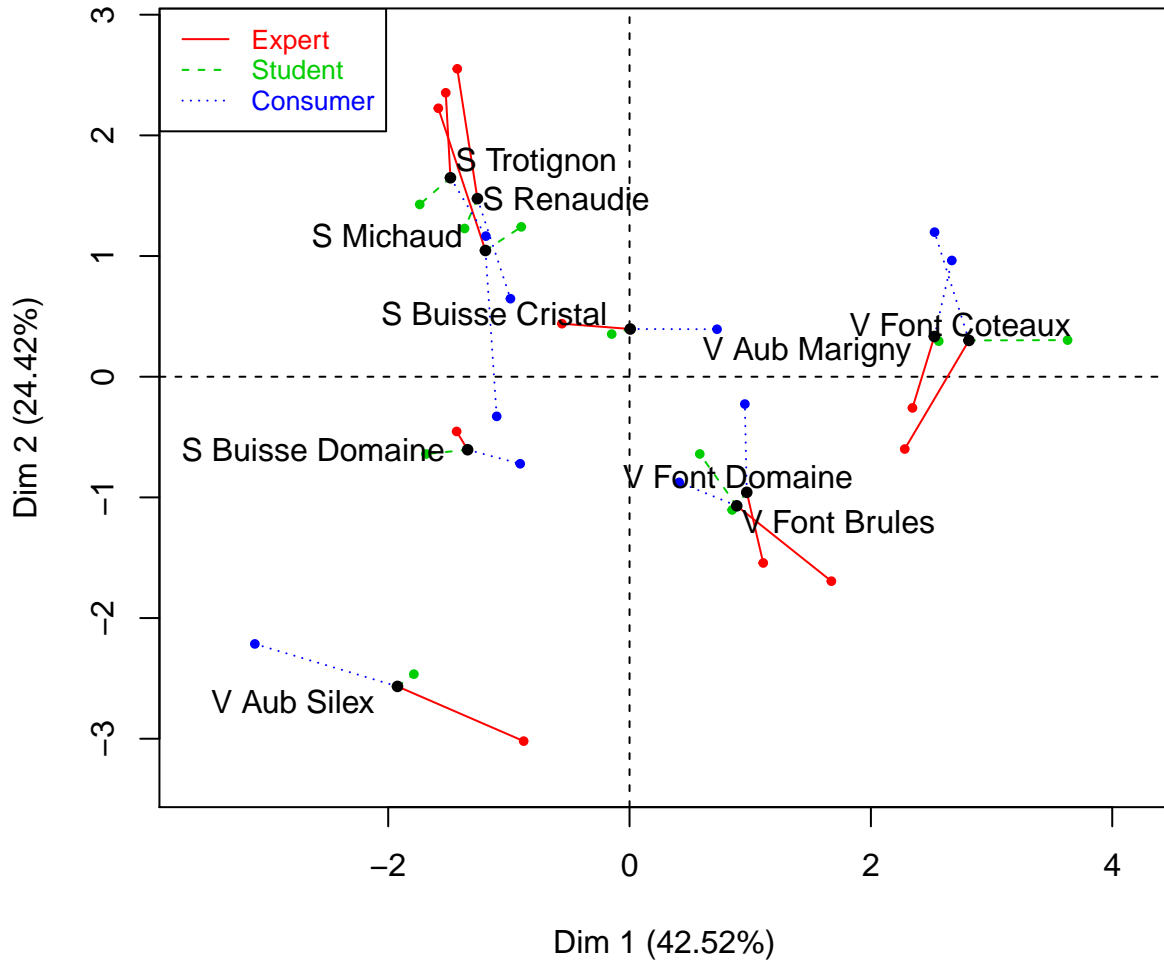
Graph of the supplementary variables



Graph with the partial points

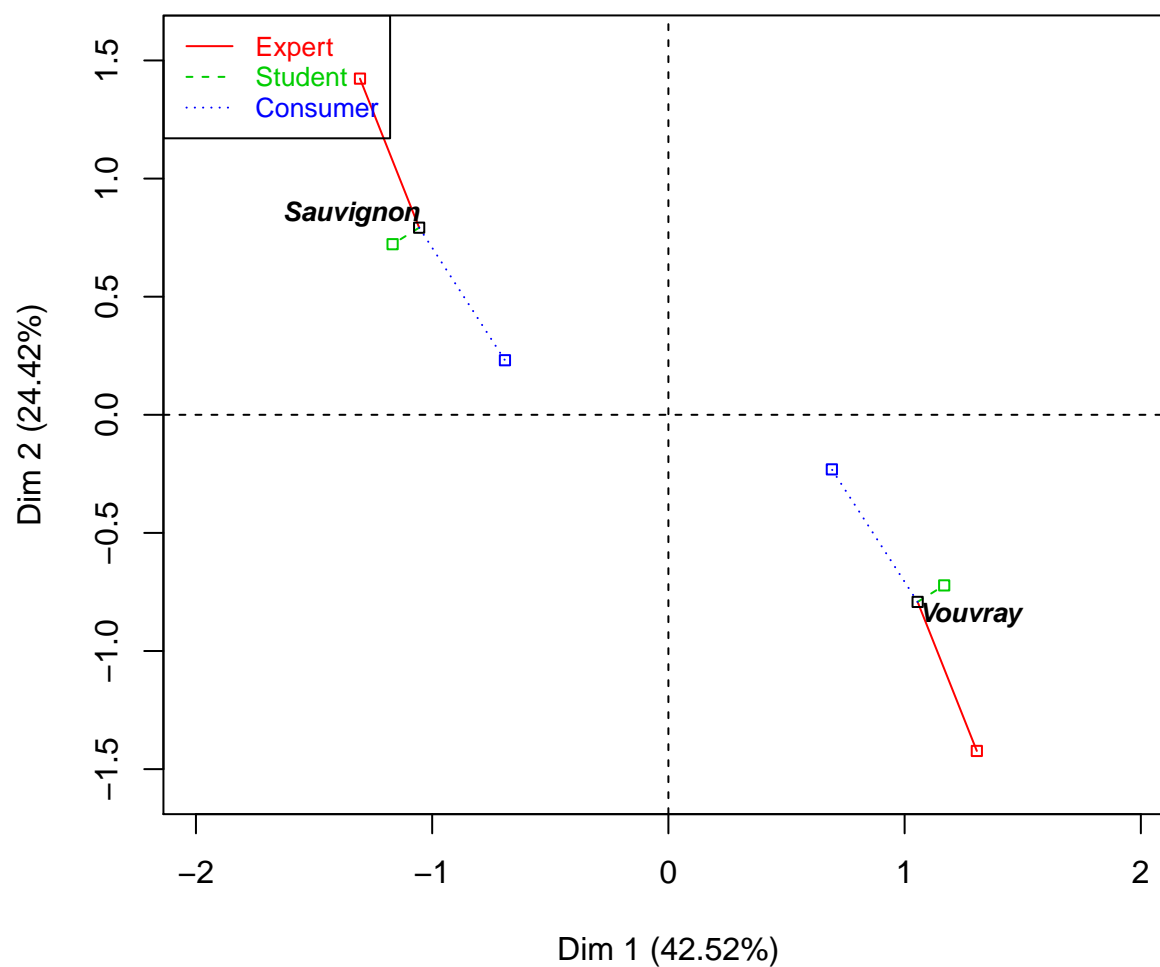
```
plot(res,choix="ind", partial="all", invisible="quali", title="Graph with the partial points")
```

Graph with the partial points



```
plot(res, cex=0.8, invisible="ind", partial="all", title="Graph of the individuals")
```

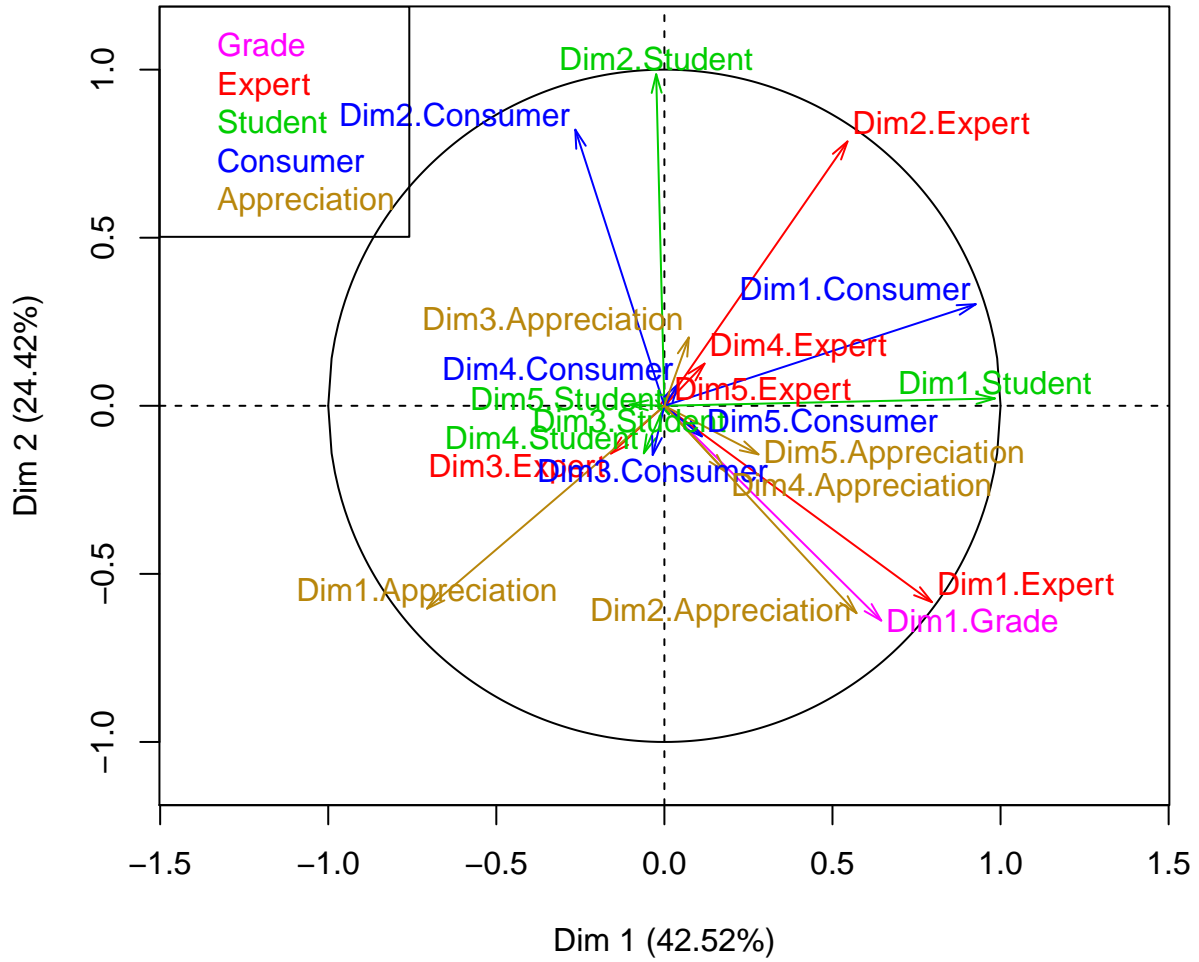
Graph of the individuals



Graph of the partial axes

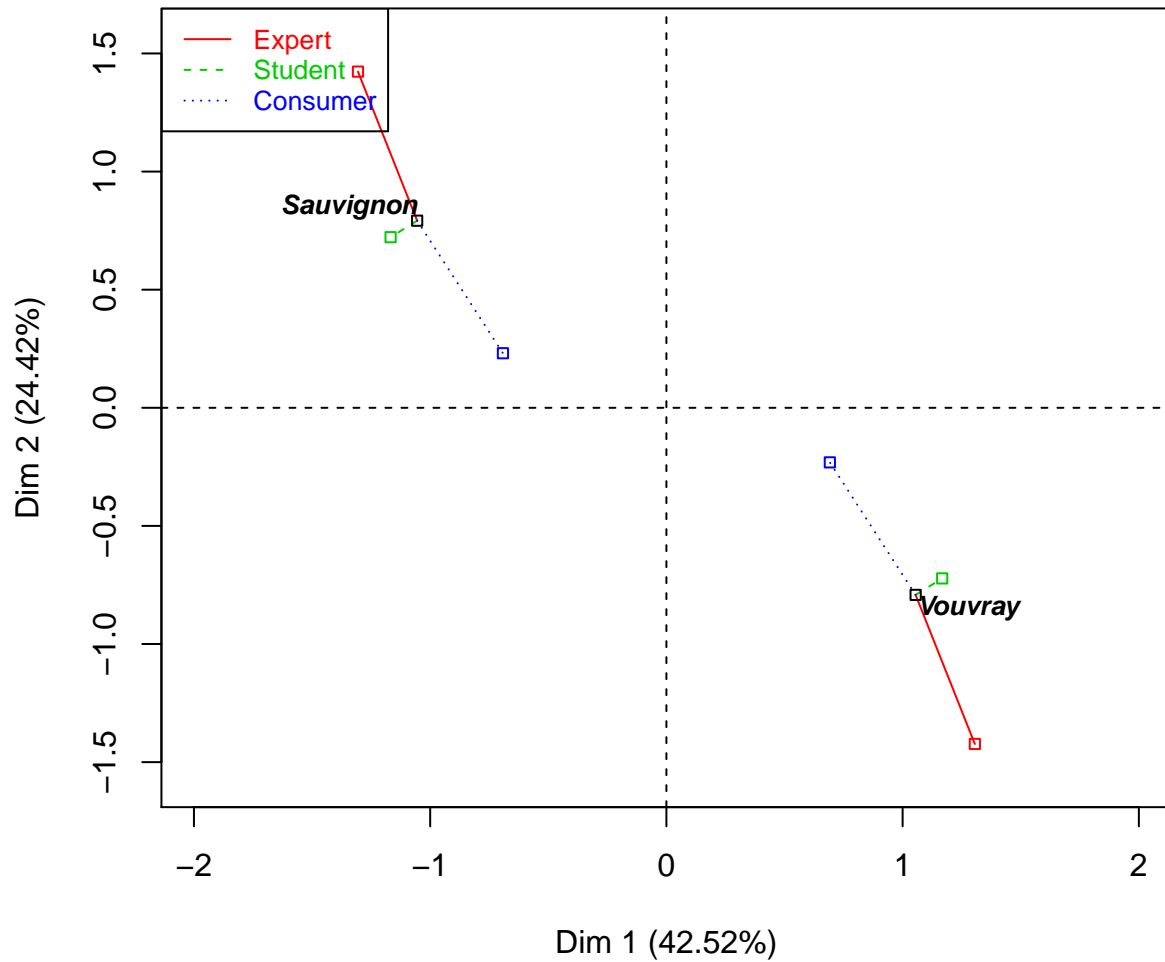
```
plot(res,choix="axes")
```

Partial axes



```
plot(res, cex=0.8, invisible="ind", partial="all")
```


Individual factor map



Color the individuals according to a qualitative variable

```
plot(res, cex=0.8, habillage=1)
```

Individual factor map

