le cnam
Ile-de-France

CERTIFICAT DE SPÉCIALISATION ANALYSTE DE DONNÉES MASSIVES

Entreposage et fouille de données

Projet de STA211

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$$u(x) \approx U_h = \sum_{j=1}^{N} c_j \varphi_j(x)$$

$$u''(x_i) \approx \frac{1}{h^2}[u(x_{i+1}) - 2u(x_i) + u(x_{i-1})]$$

Résumé

1. Introduction

2. Chargement des données et analyses préliminaires

Cette partie est consacrée au chargement des données et à la sélection des variables liées au ménage. Certaines variables qui sont codées comme des variables numériques mais qui en réalité sont qualitatives seront recordées en variables facteurs.

2.1 Chargement des données

Après le chargement des données, l'étape suivante est l'analyse univariée. On peut regarder les statistiques descriptives simples avec la function **summary** et la fonction **describe**.

```
##  Sexe      Diplome_Max  Type_Prof Occupation Source_ppale_Res Structure_menage
##  1: 549   4      :454   1: 36     1:777      1:845            1: 398
##  2:1018   8      :175   2: 70     2: 80      2: 87            2: 103
##           1      :171   3:435     3: 50      3:493            3:1053
##           9      :168   4:391     4:541      4: 71            4:  13
##           6      :157   5:297     5: 45      5: 71
##           5      :137   6:316     6: 74
##           (Other):305   7: 22
##       Age           Revenus     TYPEMEN Nb_Enfants_sup_10 Nb_Enfants_inf_10
##  Min.   :18.00   Min.   : 535   1:190   Min.   :0.0000    Min.   :0.0000
##  1st Qu.:41.00   1st Qu.:1799   2:144   1st Qu.:0.0000    1st Qu.:0.0000
##  Median :52.00   Median :2349   3: 75   Median :0.0000    Median :0.0000
##  Mean   :51.87   Mean   :2573   4:301   Mean   :0.4359    Mean   :0.3165
##  3rd Qu.:61.50   3rd Qu.:2899   5:114   3rd Qu.:1.0000    3rd Qu.:0.0000
##  Max.   :89.00   Max.   :7600   6:228   Max.   :3.0000    Max.   :3.0000
##                                 7:515
## Description of .
##
##  Numeric
##                      mean median min  max        var      sd
## Age                 51.87     52  18   89     209.91   14.49
```

```
## Revenus           2573.20   2349 535 7600 1967644.23 1402.73
## Nb_Enfants_sup_10    0.44      0   0    3       0.67    0.82
## Nb_Enfants_inf_10    0.32      0   0    3       0.48    0.70
##
##  Factor
##
## Sexe            2      1
##   Count   1018.00 549.00
##   Percent   64.96  35.04
## Mode 2
##
## Diplome_Max      4      8      1      9      6      5      7      3     2
##     Count   454.00 175.00 171.00 168.00 157.00 137.00 132.00 117.00 56.00
##     Percent  28.97  11.17  10.91  10.72  10.02   8.74   8.42   7.47  3.57
## Mode 4
##
## Type_Prof      3      4      6      5     2    1    7
##   Count   435.00 391.00 316.00 297.00 70.00 36.0 22.0
##   Percent  27.76  24.95  20.17  18.95  4.47  2.3  1.4
## Mode 3
##
## Occupation      1      4     2     6     3     5
##    Count   777.00 541.00 80.00 74.00 50.00 45.00
##    Percent  49.59  34.52  5.11  4.72  3.19  2.87
## Mode 1
##
## Source_ppale_Res      1      3     2     4     5
##          Count   845.00 493.00 87.00 71.00 71.00
##          Percent  53.92  31.46  5.55  4.53  4.53
## Mode 1
##
## Structure_menage      3     1      2     4
##          Count   1053.0 398.0 103.00 13.00
##          Percent   67.2  25.4   6.57  0.83
## Mode 3
```

```
##
## TYPEMEN         7      4      6      1      2      5     3
##   Count    515.00 301.00 228.00 190.00 144.00 114.00 75.00
##   Percent  32.87  19.21  14.55  12.13   9.19   7.28  4.79
## Mode 7
```

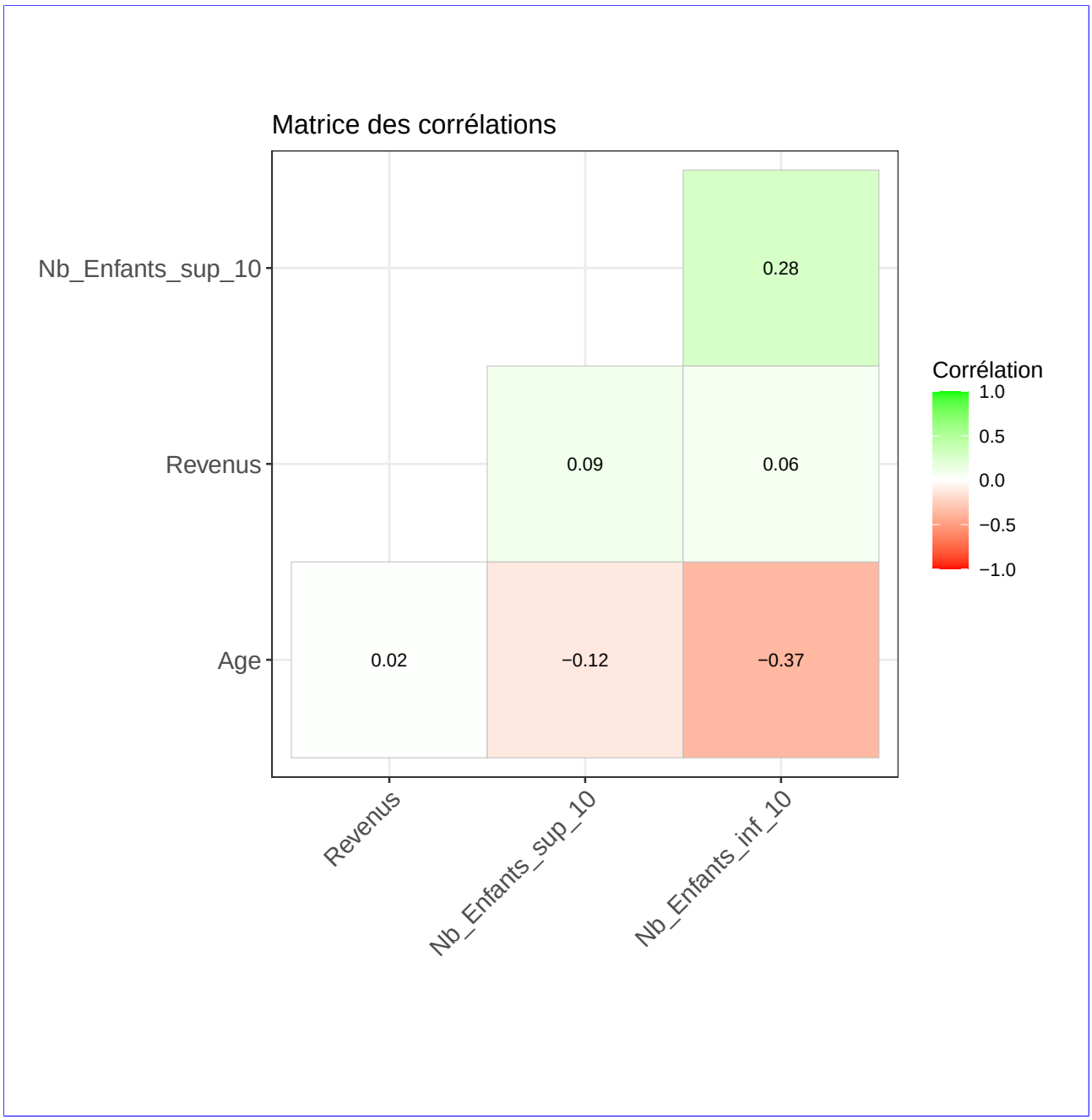
2.2 Analyse descriptive des variables quantitatives

2.2.1 Analyse univarié

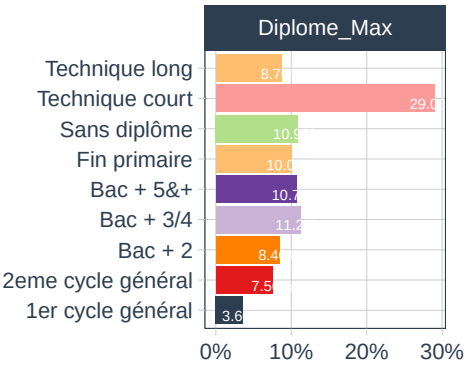
Variables	Moyenne	Médiane	Min	Maximum	Variance	Ecart-type
Age	51.87	52	18	89	209.91	14.49
Revenus	2 573.20	2 349	535	7 600	1 967 644.23	1 402.73
Nombre d'enfants dont âge > 10 ans	0.44	0	0	3	0.67	0.82
Nombre d'enfants dont âge <= 10 ans	0.32	0	0	3	0.48	0.70

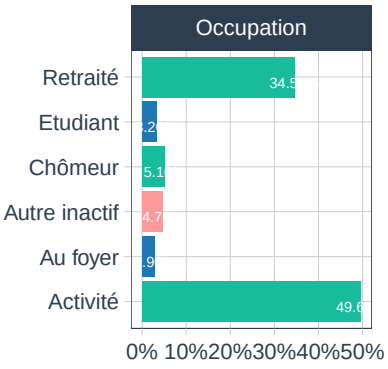
TABLE 1 – Statistiques descriptives des variables quantitatives

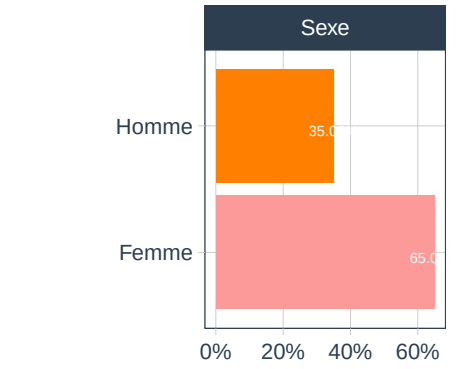
2.2.2 Analyse bivariée : Etudes des liaisons entre les différentes variables quantitatives

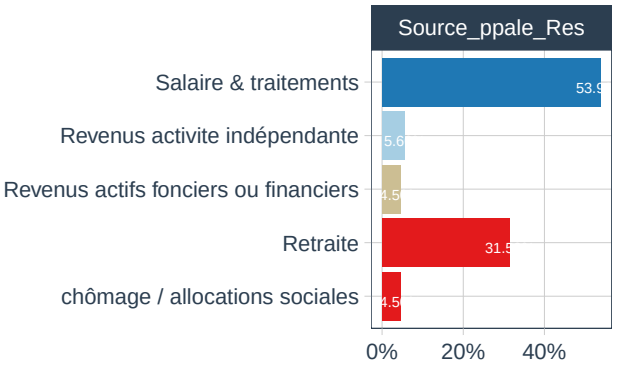


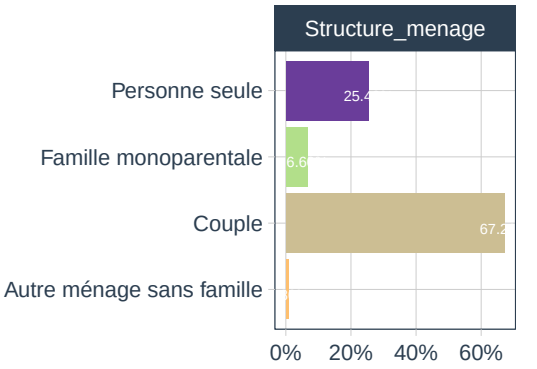
Les corrélations entre les variables sont très faibles dans

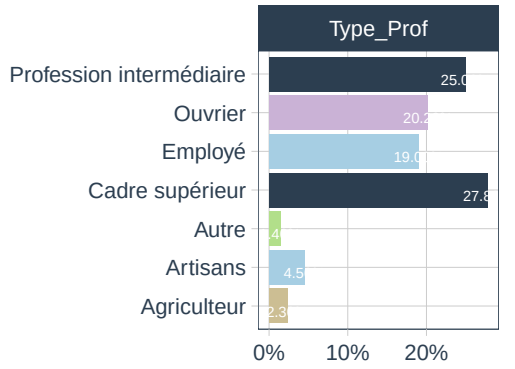

Diplome_Max
Technique long
Technique court
Sans diplôme
Fin primaire
Bac + 5&+
Bac + 3/4
Bac + 2
2eme cycle général
1er cycle général
8.7
29.0
10.5
10.0
10.7
11.2
8.4
7.5
3.6
0%
10%
20%
30%

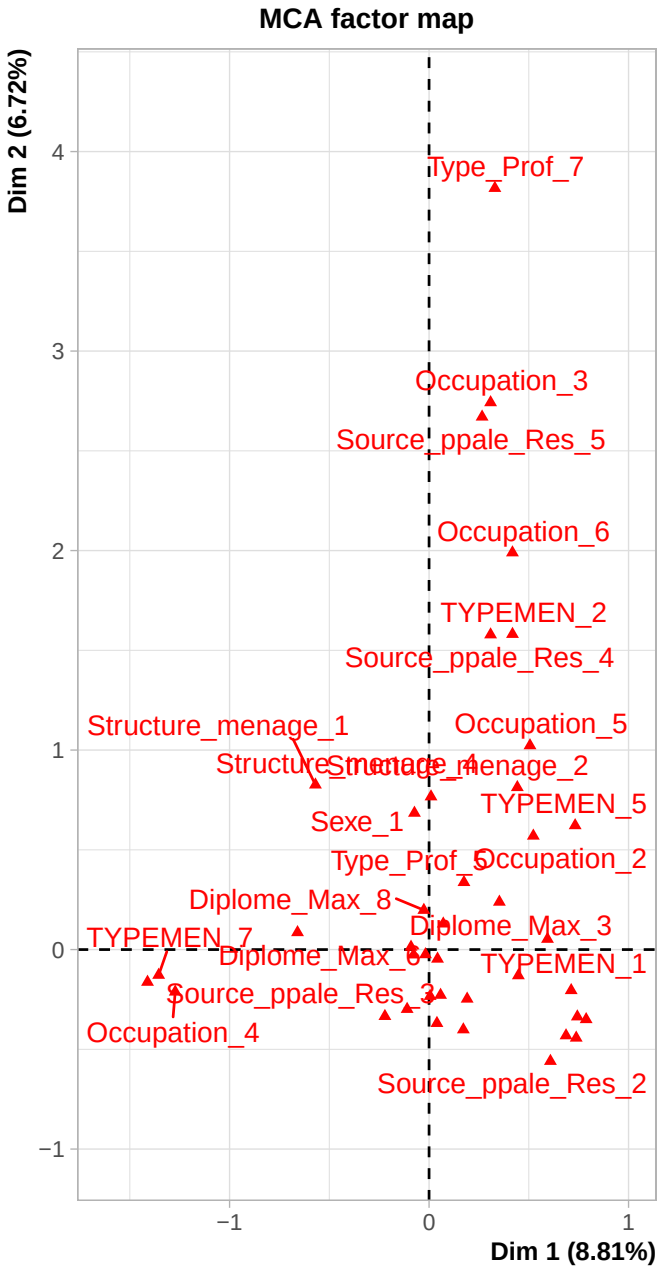

Occupation
Retraité
Etudiant
Chômeur
Autre inactif
Au foyer
Activité
34.5
5.1
4.7
49.6
0% 10%20%30%40%50%

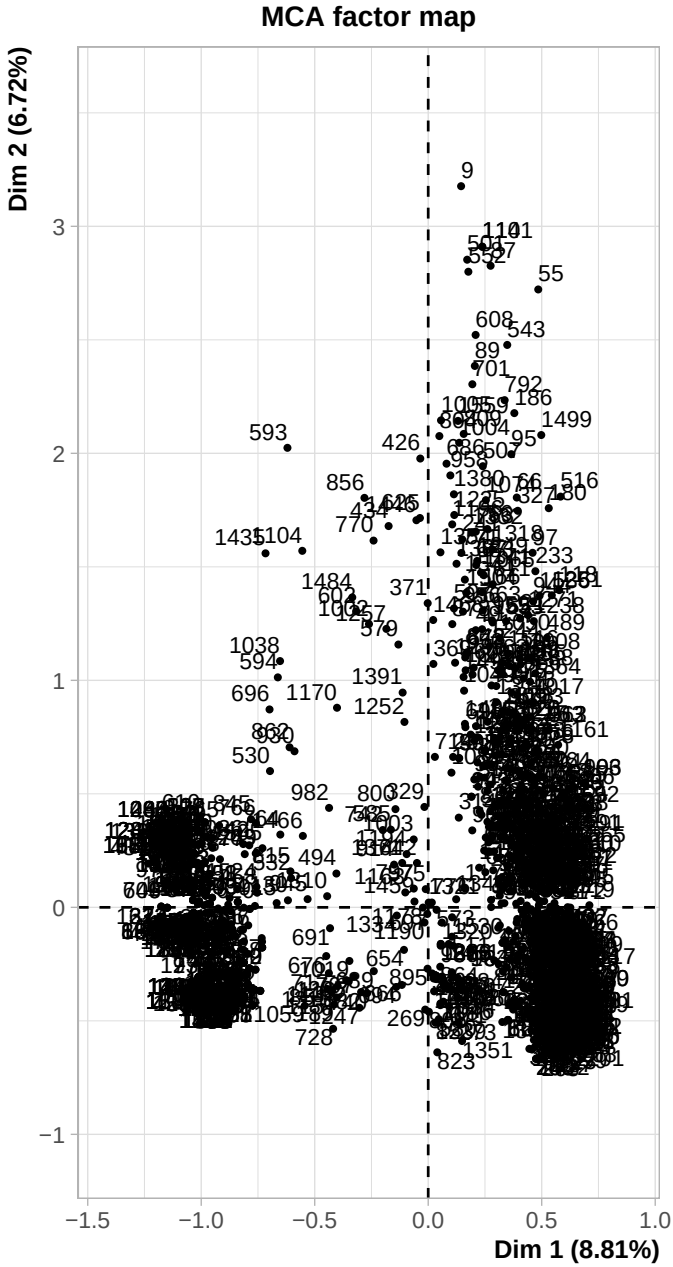

Sexe
Homme
Femme
35.0
65.0
0%
20%
40%
60%

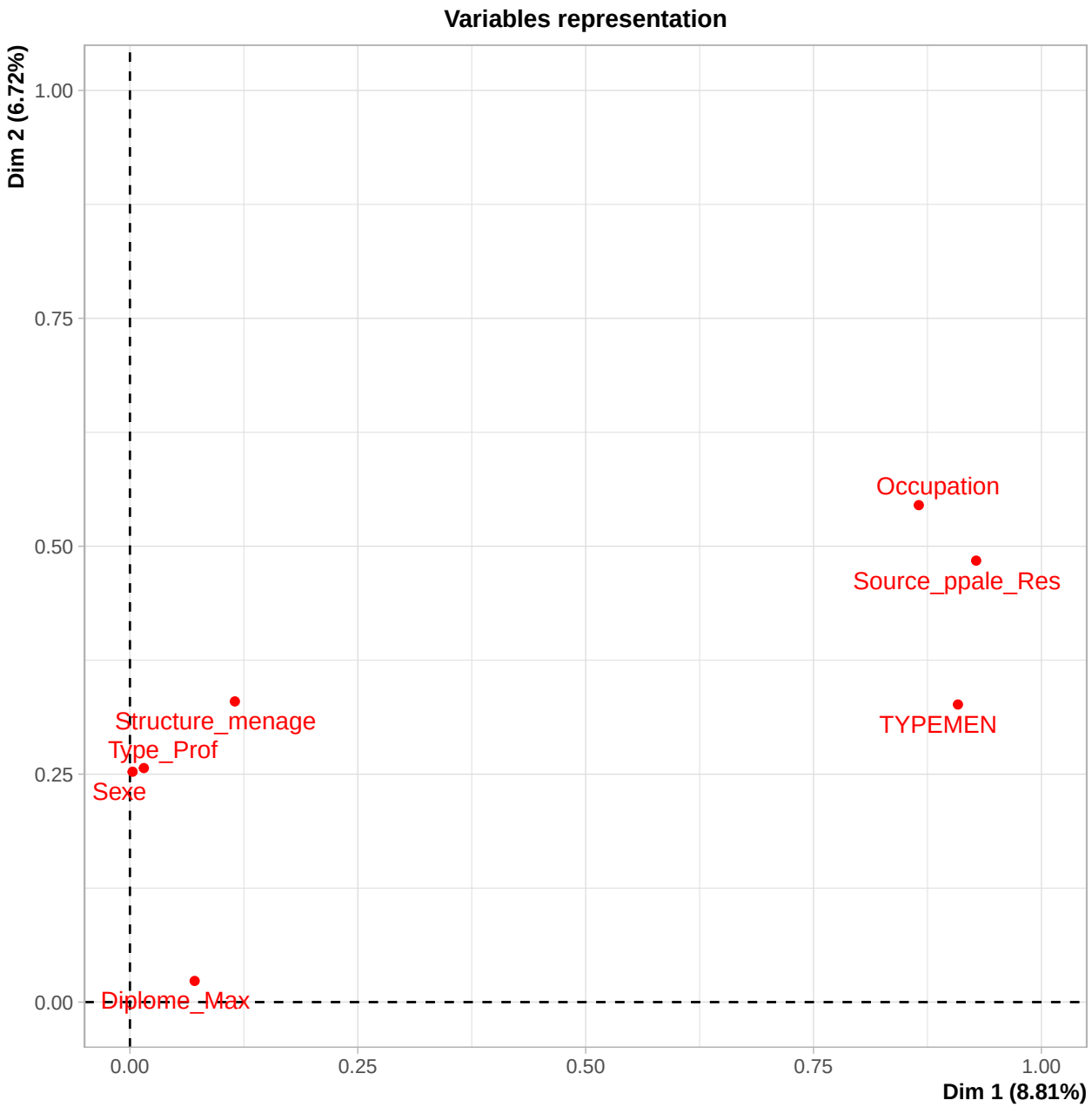

Source_ppale_Res
Salaire & traitements
Revenus activite indépendante
Revenus actifs fonciers ou financiers
Retraite
chômage / allocations sociales
53.9
5.6
4.5
31.5
4.5
0%
20%
40%

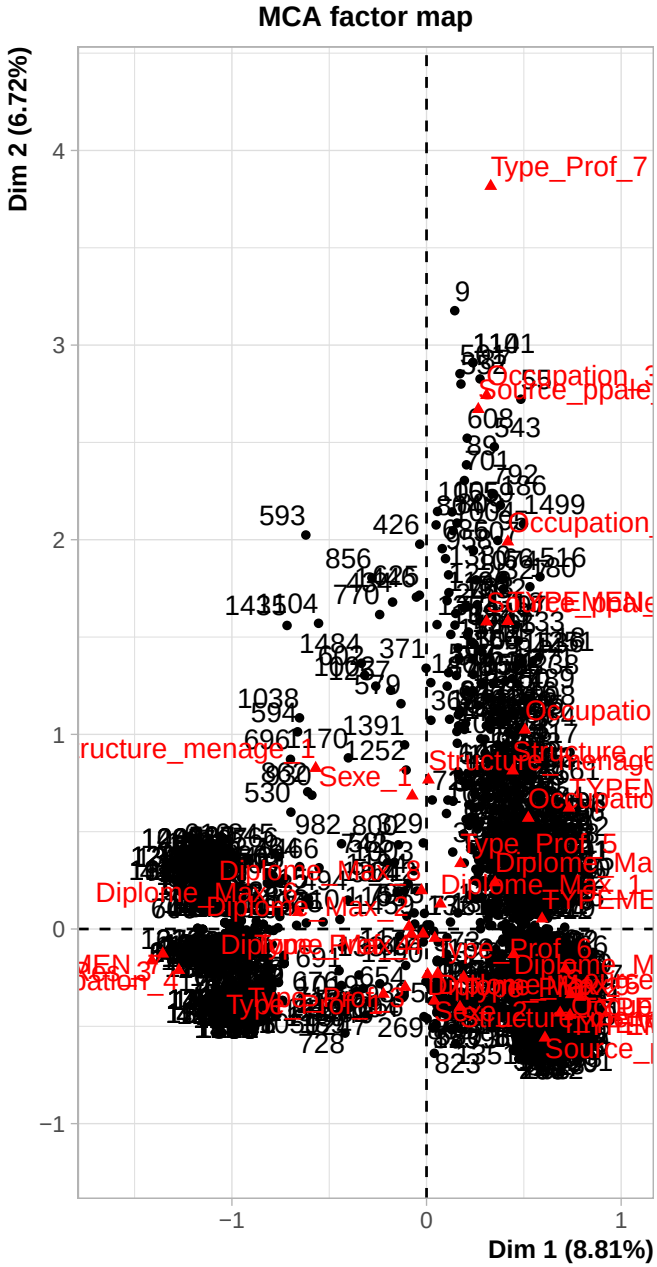

Structure_menage
Personne seule
Famille monoparentale
Couple
Autre ménage sans famille
25.4
6.6
67.2
0%
20%
40%
60%


Type_Prof
Profession intermédiaire
Ouvrier
Employé
Cadre supérieur
Autre
Artisans
Agriculteur
25.0
20.2
19.0
27.8
4.5
0%
10%
20%


MCA factor map
Dim 2 (6.72%)
Dim 1 (8.81%)
Type_Prof_7
Occupation_3
Source_ppale_Res_5
Occupation_6
TYPEMEN_2
Source_ppale_Res_4
Structure_menage_1
Occupation_5
Structure_menage_4
Structure_menage_2
TYPEMEN_5
Sexe_1
Type_Prof_5
Occupation_2
Diplome_Max_8
Diplome_Max_3
TYPEMEN_7
Diplome_Max_6
TYPEMEN_1
Source_ppale_Res_3
Occupation_4
Source_ppale_Res_2
4
3
2
1
0
−1
−1
0
1


MCA factor map
Dim 2 (6.72%)
Dim 1 (8.81%)
3
2
1
0
−1
−1.5
−1.0
−0.5
0.0
0.5
1.0


Variables representation
Dim 2 (6.72%)
1.00
0.75
0.50
0.25
0.00
Occupation
Source_ppale_Res
Structure_menage
TYPEMEN
Type_Prof
Sexe
Diplome_Max
0.00
0.25
0.50
0.75
1.00
Dim 1 (8.81%)




```
## [1] "----------------Sexe  CONTRE  Diplome_Max------------------"
##
##  Pearson's Chi-squared test
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 20.566, df = 8, p-value = 0.008393
##
## [1] "----------------Sexe  CONTRE  Type_Prof------------------"
##
##  Pearson's Chi-squared test
```

```
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 41.855, df = 6, p-value = 1.964e-07
##
## [1] "----------------Sexe  CONTRE  Occupation-----------------"
##
##  Pearson's Chi-squared test
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 112.29, df = 5, p-value < 2.2e-16
##
## [1] "---------------Sexe  CONTRE  Source_ppale_Res-----------------"
##
##  Pearson's Chi-squared test
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 28.434, df = 4, p-value = 1.019e-05
##
## [1] "---------------Sexe  CONTRE  Structure_menage-----------------"
##
##  Pearson's Chi-squared test
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 191.39, df = 3, p-value < 2.2e-16
##
## [1] "---------------Sexe  CONTRE  TYPEMEN-----------------"
##
##  Pearson's Chi-squared test
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 146.96, df = 6, p-value < 2.2e-16
##
## [1] "---------------Diplome_Max  CONTRE  Sexe-----------------"
##
##  Pearson's Chi-squared test
```

```
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 20.566, df = 8, p-value = 0.008393
##
## [1] "----------------Diplome_Max  CONTRE  Type_Prof------------------"
##
##  Pearson's Chi-squared test
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 193.54, df = 48, p-value < 2.2e-16
##
## [1] "----------------Diplome_Max  CONTRE  Occupation------------------"
##
##  Pearson's Chi-squared test
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 83.567, df = 40, p-value = 6.568e-05
##
## [1] "----------------Diplome_Max  CONTRE  Source_ppale_Res------------------"
##
##  Pearson's Chi-squared test
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 74.595, df = 32, p-value = 2.969e-05
##
## [1] "----------------Diplome_Max  CONTRE  Structure_menage------------------"
##
##  Pearson's Chi-squared test
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 26.415, df = 24, p-value = 0.3324
##
## [1] "----------------Diplome_Max  CONTRE  TYPEMEN------------------"
##
##  Pearson's Chi-squared test
```

```
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 95.833, df = 48, p-value = 4.999e-05
##
## [1] "----------------Type_Prof  CONTRE  Sexe------------------"
##
##  Pearson's Chi-squared test
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 41.855, df = 6, p-value = 1.964e-07
##
## [1] "----------------Type_Prof  CONTRE  Diplome_Max------------------"
##
##  Pearson's Chi-squared test
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 193.54, df = 48, p-value < 2.2e-16
##
## [1] "----------------Type_Prof  CONTRE  Occupation------------------"
##
##  Pearson's Chi-squared test
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 440.03, df = 30, p-value < 2.2e-16
##
## [1] "----------------Type_Prof  CONTRE  Source_ppale_Res------------------"
##
##  Pearson's Chi-squared test
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 208.64, df = 24, p-value < 2.2e-16
##
## [1] "----------------Type_Prof  CONTRE  Structure_menage------------------"
##
##  Pearson's Chi-squared test
```

```
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 43.018, df = 18, p-value = 0.0007957
##
## [1] "----------------Type_Prof  CONTRE  TYPEMEN------------------"
##
##  Pearson's Chi-squared test
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 125.82, df = 36, p-value = 6.912e-12
##
## [1] "---------------Occupation  CONTRE  Sexe-----------------"
##
##  Pearson's Chi-squared test
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 112.29, df = 5, p-value < 2.2e-16
##
## [1] "---------------Occupation  CONTRE  Diplome_Max-----------------"
##
##  Pearson's Chi-squared test
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 83.567, df = 40, p-value = 6.568e-05
##
## [1] "---------------Occupation  CONTRE  Type_Prof-----------------"
##
##  Pearson's Chi-squared test
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 440.03, df = 30, p-value < 2.2e-16
##
## [1] "---------------Occupation  CONTRE  Source_ppale_Res-----------------"
##
##  Pearson's Chi-squared test
```

```
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 1989.8, df = 20, p-value < 2.2e-16
##
## [1] "----------------Occupation  CONTRE  Structure_menage------------------"
##
##  Pearson's Chi-squared test
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 104.78, df = 15, p-value = 1.61e-15
##
## [1] "----------------Occupation  CONTRE  TYPEMEN------------------"
##
##  Pearson's Chi-squared test
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 1263.4, df = 30, p-value < 2.2e-16
##
## [1] "----------------Source_ppale_Res  CONTRE  Sexe------------------"
##
##  Pearson's Chi-squared test
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 28.434, df = 4, p-value = 1.019e-05
##
## [1] "----------------Source_ppale_Res  CONTRE  Diplome_Max------------------"
##
##  Pearson's Chi-squared test
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 74.595, df = 32, p-value = 2.969e-05
##
## [1] "----------------Source_ppale_Res  CONTRE  Type_Prof------------------"
##
##  Pearson's Chi-squared test
```

```
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 208.64, df = 24, p-value < 2.2e-16
##
## [1] "----------------Source_ppale_Res  CONTRE  Occupation-----------------"
##
##  Pearson's Chi-squared test
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 1989.8, df = 20, p-value < 2.2e-16
##
## [1] "----------------Source_ppale_Res  CONTRE  Structure_menage-----------------"
##
##  Pearson's Chi-squared test
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 163.62, df = 12, p-value < 2.2e-16
##
## [1] "----------------Source_ppale_Res  CONTRE  TYPEMEN-----------------"
##
##  Pearson's Chi-squared test
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 1420.4, df = 24, p-value < 2.2e-16
##
## [1] "----------------Structure_menage  CONTRE  Sexe-----------------"
##
##  Pearson's Chi-squared test
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 191.39, df = 3, p-value < 2.2e-16
##
## [1] "----------------Structure_menage  CONTRE  Diplome_Max-----------------"
##
##  Pearson's Chi-squared test
```

```
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 26.415, df = 24, p-value = 0.3324
##
## [1] "----------------Structure_menage  CONTRE  Type_Prof-----------------"
##
##  Pearson's Chi-squared test
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 43.018, df = 18, p-value = 0.0007957
##
## [1] "----------------Structure_menage  CONTRE  Occupation-----------------"
##
##  Pearson's Chi-squared test
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 104.78, df = 15, p-value = 1.61e-15
##
## [1] "----------------Structure_menage  CONTRE  Source_ppale_Res-----------------"
##
##  Pearson's Chi-squared test
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 163.62, df = 12, p-value < 2.2e-16
##
## [1] "----------------Structure_menage  CONTRE  TYPEMEN-----------------"
##
##  Pearson's Chi-squared test
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 502.74, df = 18, p-value < 2.2e-16
##
## [1] "----------------TYPEMEN  CONTRE  Sexe-----------------"
##
##  Pearson's Chi-squared test
```

```
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 146.96, df = 6, p-value < 2.2e-16
##
## [1] "----------------TYPEMEN  CONTRE  Diplome_Max------------------"
##
##  Pearson's Chi-squared test
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 95.833, df = 48, p-value = 4.999e-05
##
## [1] "----------------TYPEMEN  CONTRE  Type_Prof------------------"
##
##  Pearson's Chi-squared test
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 125.82, df = 36, p-value = 6.912e-12
##
## [1] "----------------TYPEMEN  CONTRE  Occupation------------------"
##
##  Pearson's Chi-squared test
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 1263.4, df = 30, p-value < 2.2e-16
##
## [1] "----------------TYPEMEN  CONTRE  Source_ppale_Res------------------"
##
##  Pearson's Chi-squared test
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 1420.4, df = 24, p-value < 2.2e-16
##
## [1] "----------------TYPEMEN  CONTRE  Structure_menage------------------"
##
##  Pearson's Chi-squared test
```

```
##
## data:  data_cat_plots[, i] and data_cat_plots[, j]
## X-squared = 502.74, df = 18, p-value < 2.2e-16


## [1] "----------------Sexe  CONTRE  Diplome_Max-----------------"
##                      X^2 df  P(> X^2)
## Likelihood Ratio 20.349  8 0.0090948
## Pearson          20.566  8 0.0083931
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.114
## Cramer's V        : 0.115
## [1] "----------------Sexe  CONTRE  Type_Prof-----------------"
##                      X^2 df   P(> X^2)
## Likelihood Ratio 40.765  6 3.2213e-07
## Pearson          41.855  6 1.9637e-07
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.161
## Cramer's V        : 0.163
## [1] "----------------Sexe  CONTRE  Occupation-----------------"
##                      X^2 df P(> X^2)
## Likelihood Ratio 114.46  5        0
## Pearson          112.29  5        0
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.259
## Cramer's V        : 0.268
## [1] "----------------Sexe  CONTRE  Source_ppale_Res-----------------"
##                      X^2 df   P(> X^2)
## Likelihood Ratio 27.358  4 1.6825e-05
## Pearson          28.434  4 1.0187e-05
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.133
```

```
## Cramer's V        : 0.135
## [1] "----------------Sexe  CONTRE  Structure_menage-----------------"
##                      X^2 df P(> X^2)
## Likelihood Ratio 187.89  3        0
## Pearson          191.39  3        0
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.33
## Cramer's V        : 0.349
## [1] "----------------Sexe  CONTRE  TYPEMEN-----------------"
##                      X^2 df P(> X^2)
## Likelihood Ratio 145.00  6        0
## Pearson          146.96  6        0
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.293
## Cramer's V        : 0.306
## [1] "----------------Diplome_Max  CONTRE  Sexe-----------------"
##                      X^2 df  P(> X^2)
## Likelihood Ratio 20.349  8 0.0090948
## Pearson          20.566  8 0.0083931
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.114
## Cramer's V        : 0.115
## [1] "----------------Diplome_Max  CONTRE  Type_Prof-----------------"
##                      X^2 df P(> X^2)
## Likelihood Ratio 189.51 48        0
## Pearson          193.54 48        0
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.332
## Cramer's V        : 0.143
## [1] "----------------Diplome_Max  CONTRE  Occupation-----------------"
##                      X^2 df   P(> X^2)
```

```
## Likelihood Ratio 84.207 40 5.4822e-05
## Pearson          83.567 40 6.5676e-05
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.225
## Cramer's V        : 0.103
## [1] "----------------Diplome_Max  CONTRE  Source_ppale_Res------------------"
##                     X^2 df   P(> X^2)
## Likelihood Ratio 76.358 32 1.7224e-05
## Pearson          74.595 32 2.9694e-05
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.213
## Cramer's V        : 0.109
## [1] "----------------Diplome_Max  CONTRE  Structure_menage------------------"
##                     X^2 df P(> X^2)
## Likelihood Ratio 27.771 24  0.26983
## Pearson          26.415 24  0.33245
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.129
## Cramer's V        : 0.075
## [1] "----------------Diplome_Max  CONTRE  TYPEMEN------------------"
##                     X^2 df   P(> X^2)
## Likelihood Ratio 96.543 48 4.1295e-05
## Pearson          95.833 48 4.9992e-05
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.24
## Cramer's V        : 0.101
## [1] "----------------Type_Prof  CONTRE  Sexe------------------"
##                     X^2 df   P(> X^2)
## Likelihood Ratio 40.765  6 3.2213e-07
## Pearson          41.855  6 1.9637e-07
##
```

```
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.161
## Cramer's V        : 0.163
## [1] "----------------Type_Prof  CONTRE  Diplome_Max------------------"
##                      X^2 df P(> X^2)
## Likelihood Ratio 189.51 48        0
## Pearson          193.54 48        0
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.332
## Cramer's V        : 0.143
## [1] "----------------Type_Prof  CONTRE  Occupation------------------"
##                      X^2 df P(> X^2)
## Likelihood Ratio 291.71 30        0
## Pearson          440.03 30        0
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.468
## Cramer's V        : 0.237
## [1] "----------------Type_Prof  CONTRE  Source_ppale_Res------------------"
##                      X^2 df P(> X^2)
## Likelihood Ratio 156.66 24        0
## Pearson          208.64 24        0
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.343
## Cramer's V        : 0.182
## [1] "----------------Type_Prof  CONTRE  Structure_menage------------------"
##                      X^2 df   P(> X^2)
## Likelihood Ratio 41.670 18 0.00122949
## Pearson          43.018 18 0.00079568
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.163
## Cramer's V        : 0.096
```

```
## [1] "----------------Type_Prof  CONTRE  TYPEMEN-----------------"
##                      X^2 df   P(> X^2)
## Likelihood Ratio 121.03 36 3.9728e-11
## Pearson          125.82 36 6.9120e-12
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.273
## Cramer's V        : 0.116
## [1] "----------------Occupation  CONTRE  Sexe-----------------"
##                      X^2 df P(> X^2)
## Likelihood Ratio 114.46  5        0
## Pearson          112.29  5        0
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.259
## Cramer's V        : 0.268
## [1] "----------------Occupation  CONTRE  Diplome_Max-----------------"
##                      X^2 df   P(> X^2)
## Likelihood Ratio 84.207 40 5.4822e-05
## Pearson          83.567 40 6.5676e-05
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.225
## Cramer's V        : 0.103
## [1] "----------------Occupation  CONTRE  Type_Prof-----------------"
##                      X^2 df P(> X^2)
## Likelihood Ratio 291.71 30        0
## Pearson          440.03 30        0
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.468
## Cramer's V        : 0.237
## [1] "----------------Occupation  CONTRE  Source_ppale_Res-----------------"
##                      X^2 df P(> X^2)
## Likelihood Ratio 1811.8 20        0
```

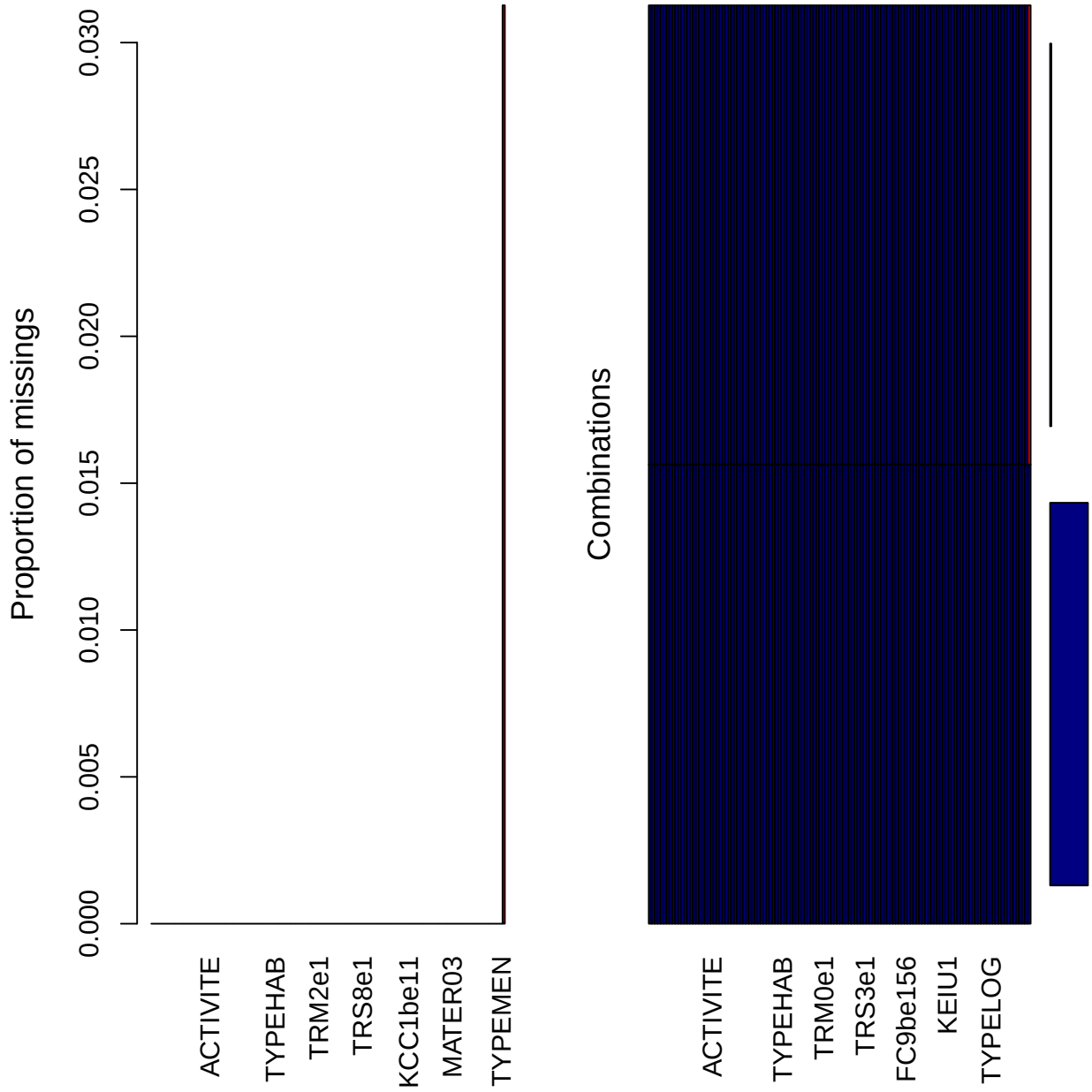
```
## Pearson          1989.8 20        0
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.748
## Cramer's V        : 0.563
## [1] "----------------Occupation  CONTRE  Structure_menage------------------"
##                     X^2 df   P(> X^2)
## Likelihood Ratio 100.46 15 1.0658e-14
## Pearson          104.78 15 1.6653e-15
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.25
## Cramer's V        : 0.149
## [1] "----------------Occupation  CONTRE  TYPEMEN------------------"
##                     X^2 df P(> X^2)
## Likelihood Ratio 1376.8 30        0
## Pearson          1263.4 30        0
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.668
## Cramer's V        : 0.402
## [1] "----------------Source_ppale_Res  CONTRE  Sexe------------------"
##                     X^2 df   P(> X^2)
## Likelihood Ratio 27.358  4 1.6825e-05
## Pearson          28.434  4 1.0187e-05
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.133
## Cramer's V        : 0.135
## [1] "----------------Source_ppale_Res  CONTRE  Diplome_Max------------------"
##                     X^2 df   P(> X^2)
## Likelihood Ratio 76.358 32 1.7224e-05
## Pearson          74.595 32 2.9694e-05
##
## Phi-Coefficient   : NA
```

```
## Contingency Coeff.: 0.213
## Cramer's V        : 0.109
## [1] "----------------Source_ppale_Res  CONTRE  Type_Prof-----------------"
##                      X^2 df P(> X^2)
## Likelihood Ratio 156.66 24        0
## Pearson          208.64 24        0
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.343
## Cramer's V        : 0.182
## [1] "----------------Source_ppale_Res  CONTRE  Occupation-----------------"
##                      X^2 df P(> X^2)
## Likelihood Ratio 1811.8 20        0
## Pearson          1989.8 20        0
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.748
## Cramer's V        : 0.563
## [1] "----------------Source_ppale_Res  CONTRE  Structure_menage-----------------"
##                      X^2 df P(> X^2)
## Likelihood Ratio 165.35 12        0
## Pearson          163.62 12        0
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.307
## Cramer's V        : 0.187
## [1] "----------------Source_ppale_Res  CONTRE  TYPEMEN-----------------"
##                      X^2 df P(> X^2)
## Likelihood Ratio 1608.1 24        0
## Pearson          1420.4 24        0
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.69
## Cramer's V        : 0.476
## [1] "----------------Structure_menage  CONTRE  Sexe-----------------"
```

```
##                     X^2 df P(> X^2)
## Likelihood Ratio 187.89  3        0
## Pearson          191.39  3        0
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.33
## Cramer's V        : 0.349
## [1] "----------------Structure_menage  CONTRE  Diplome_Max------------------"
##                     X^2 df P(> X^2)
## Likelihood Ratio 27.771 24  0.26983
## Pearson          26.415 24  0.33245
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.129
## Cramer's V        : 0.075
## [1] "----------------Structure_menage  CONTRE  Type_Prof------------------"
##                     X^2 df   P(> X^2)
## Likelihood Ratio 41.670 18 0.00122949
## Pearson          43.018 18 0.00079568
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.163
## Cramer's V        : 0.096
## [1] "----------------Structure_menage  CONTRE  Occupation------------------"
##                     X^2 df   P(> X^2)
## Likelihood Ratio 100.46 15 1.0658e-14
## Pearson          104.78 15 1.6653e-15
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.25
## Cramer's V        : 0.149
## [1] "----------------Structure_menage  CONTRE  Source_ppale_Res------------------"
##                     X^2 df P(> X^2)
## Likelihood Ratio 165.35 12        0
## Pearson          163.62 12        0
```

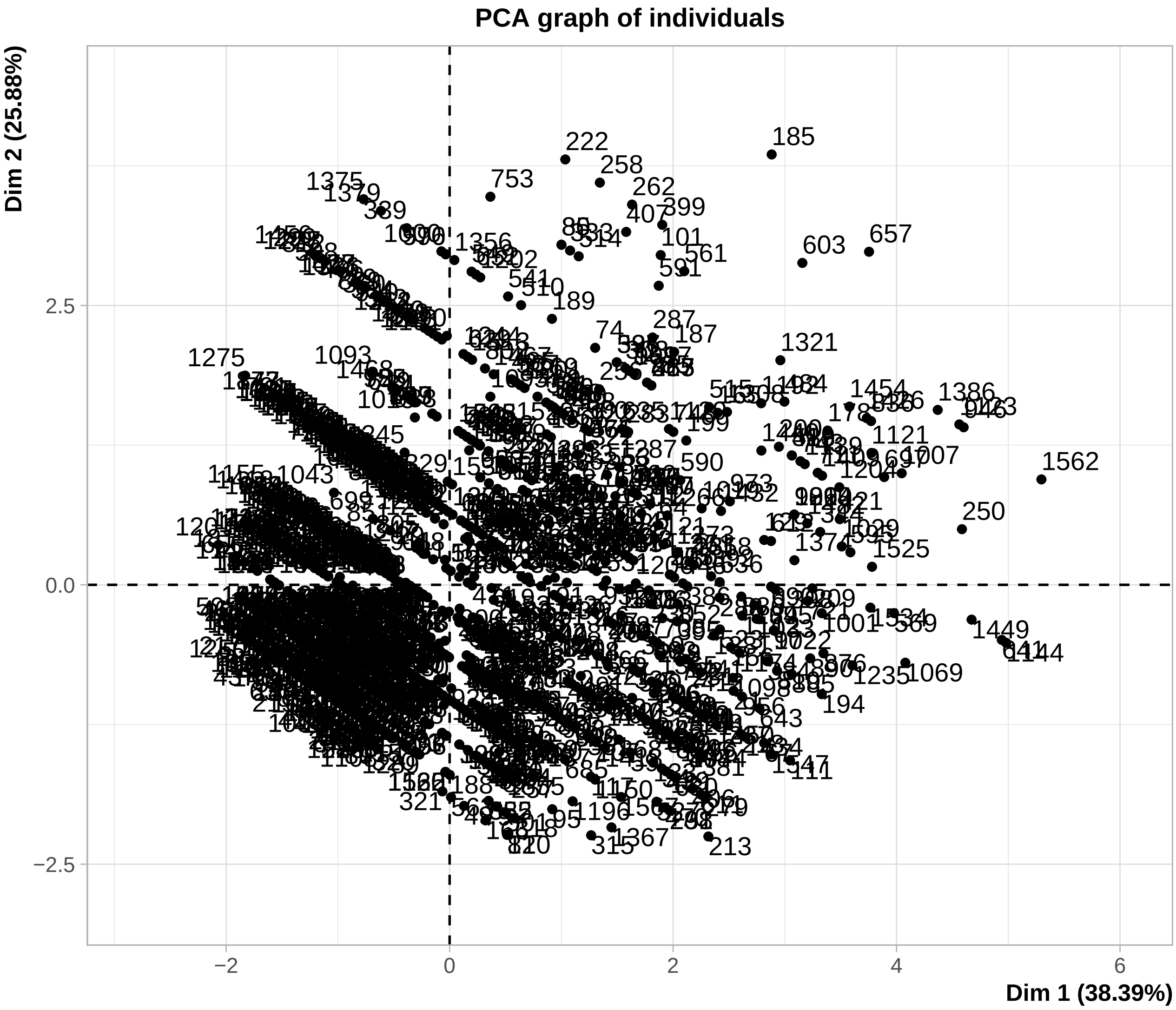
```
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.307
## Cramer's V        : 0.187
## [1] "----------------Structure_menage  CONTRE  TYPEMEN-----------------"
##                      X^2 df P(> X^2)
## Likelihood Ratio 479.07 18        0
## Pearson          502.74 18        0
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.493
## Cramer's V        : 0.327
## [1] "----------------TYPEMEN  CONTRE  Sexe-----------------"
##                      X^2 df P(> X^2)
## Likelihood Ratio 145.00  6        0
## Pearson          146.96  6        0
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.293
## Cramer's V        : 0.306
## [1] "----------------TYPEMEN  CONTRE  Diplome_Max-----------------"
##                      X^2 df   P(> X^2)
## Likelihood Ratio 96.543 48 4.1295e-05
## Pearson          95.833 48 4.9992e-05
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.24
## Cramer's V        : 0.101
## [1] "----------------TYPEMEN  CONTRE  Type_Prof-----------------"
##                      X^2 df   P(> X^2)
## Likelihood Ratio 121.03 36 3.9728e-11
## Pearson          125.82 36 6.9120e-12
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.273
```

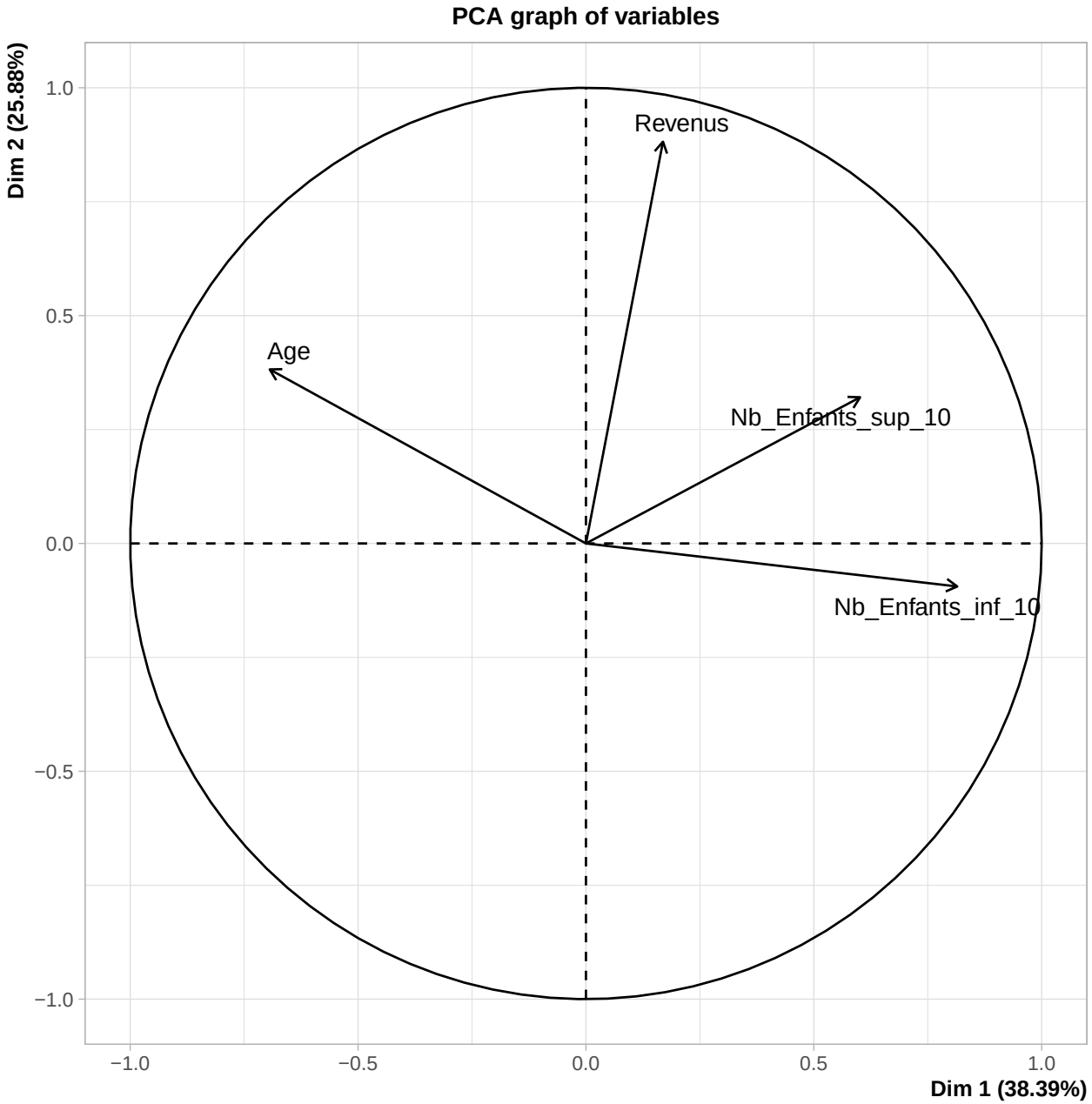
```
## Cramer's V        : 0.116
## [1] "----------------TYPEMEN  CONTRE  Occupation-----------------"
##                      X^2 df P(> X^2)
## Likelihood Ratio 1376.8 30        0
## Pearson          1263.4 30        0
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.668
## Cramer's V        : 0.402
## [1] "----------------TYPEMEN  CONTRE  Source_ppale_Res-----------------"
##                      X^2 df P(> X^2)
## Likelihood Ratio 1608.1 24        0
## Pearson          1420.4 24        0
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.69
## Cramer's V        : 0.476
## [1] "----------------TYPEMEN  CONTRE  Structure_menage-----------------"
##                      X^2 df P(> X^2)
## Likelihood Ratio 479.07 18        0
## Pearson          502.74 18        0
##
## Phi-Coefficient   : NA
## Contingency Coeff.: 0.493
## Cramer's V        : 0.327
```

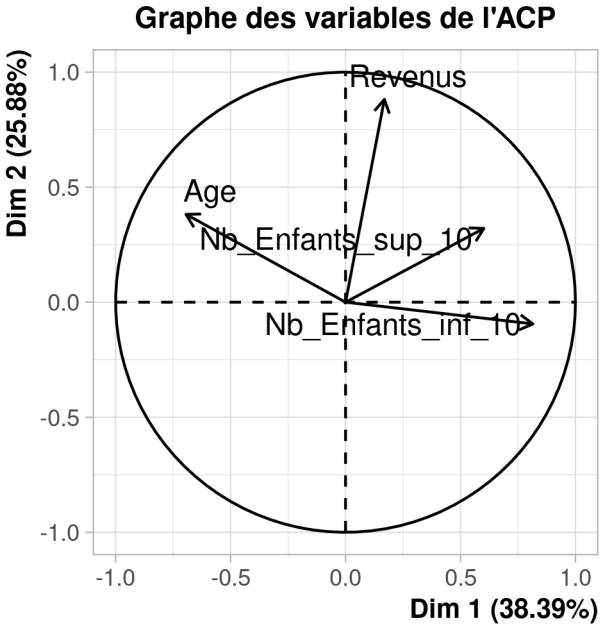



```
##
##  iter imp variable
##    1   1  LVLb  ICOS1  ICOS2  ICOS3  ICOS4  ICOS5  QPE1b  QPE2b  QPD1b  QPD2b  QPP1b  Q
##    1   2  LVLb  ICOS1  ICOS2  ICOS3  ICOS4  ICOS5  QPE1b  QPE2b  QPD1b  QPD2b  QPP1b  Q
##    1   3  LVLb  ICOS1  ICOS2  ICOS3  ICOS4  ICOS5  QPE1b  QPE2b  QPD1b  QPD2b  QPP1b  Q
##    1   4  LVLb  ICOS1  ICOS2  ICOS3  ICOS4  ICOS5  QPE1b  QPE2b  QPD1b  QPD2b  QPP1b  Q
##    1   5  LVLb  ICOS1  ICOS2  ICOS3  ICOS4  ICOS5  QPE1b  QPE2b  QPD1b  QPD2b  QPP1b  Q
##    2   1  LVLb  ICOS1  ICOS2  ICOS3  ICOS4  ICOS5  QPE1b  QPE2b  QPD1b  QPD2b  QPP1b  Q
##    2   2  LVLb  ICOS1  ICOS2  ICOS3  ICOS4  ICOS5  QPE1b  QPE2b  QPD1b  QPD2b  QPP1b  Q
##    2   3  LVLb  ICOS1  ICOS2  ICOS3  ICOS4  ICOS5  QPE1b  QPE2b  QPD1b  QPD2b  QPP1b  Q
##    2   4  LVLb  ICOS1  ICOS2  ICOS3  ICOS4  ICOS5  QPE1b  QPE2b  QPD1b  QPD2b  QPP1b  Q
```

```
##   2   5  LVLb  ICOS1  ICOS2  ICOS3  ICOS4  ICOS5  QPE1b  QPE2b  QPD1b  QPD2b  QPP1b  Q
##   3   1  LVLb  ICOS1  ICOS2  ICOS3  ICOS4  ICOS5  QPE1b  QPE2b  QPD1b  QPD2b  QPP1b  Q
##   3   2  LVLb  ICOS1  ICOS2  ICOS3  ICOS4  ICOS5  QPE1b  QPE2b  QPD1b  QPD2b  QPP1b  Q
##   3   3  LVLb  ICOS1  ICOS2  ICOS3  ICOS4  ICOS5  QPE1b  QPE2b  QPD1b  QPD2b  QPP1b  Q
##   3   4  LVLb  ICOS1  ICOS2  ICOS3  ICOS4  ICOS5  QPE1b  QPE2b  QPD1b  QPD2b  QPP1b  Q
##   3   5  LVLb  ICOS1  ICOS2  ICOS3  ICOS4  ICOS5  QPE1b  QPE2b  QPD1b  QPD2b  QPP1b  Q
##   4   1  LVLb  ICOS1  ICOS2  ICOS3  ICOS4  ICOS5  QPE1b  QPE2b  QPD1b  QPD2b  QPP1b  Q
##   4   2  LVLb  ICOS1  ICOS2  ICOS3  ICOS4  ICOS5  QPE1b  QPE2b  QPD1b  QPD2b  QPP1b  Q
##   4   3  LVLb  ICOS1  ICOS2  ICOS3  ICOS4  ICOS5  QPE1b  QPE2b  QPD1b  QPD2b  QPP1b  Q
##   4   4  LVLb  ICOS1  ICOS2  ICOS3  ICOS4  ICOS5  QPE1b  QPE2b  QPD1b  QPD2b  QPP1b  Q
##   4   5  LVLb  ICOS1  ICOS2  ICOS3  ICOS4  ICOS5  QPE1b  QPE2b  QPD1b  QPD2b  QPP1b  Q
##   5   1  LVLb  ICOS1  ICOS2  ICOS3  ICOS4  ICOS5  QPE1b  QPE2b  QPD1b  QPD2b  QPP1b  Q
##   5   2  LVLb  ICOS1  ICOS2  ICOS3  ICOS4  ICOS5  QPE1b  QPE2b  QPD1b  QPD2b  QPP1b  Q
##   5   3  LVLb  ICOS1  ICOS2  ICOS3  ICOS4  ICOS5  QPE1b  QPE2b  QPD1b  QPD2b  QPP1b  Q
##   5   4  LVLb  ICOS1  ICOS2  ICOS3  ICOS4  ICOS5  QPE1b  QPE2b  QPD1b  QPD2b  QPP1b  Q
##   5   5  LVLb  ICOS1  ICOS2  ICOS3  ICOS4  ICOS5  QPE1b  QPE2b  QPD1b  QPD2b  QPP1b  Q
```

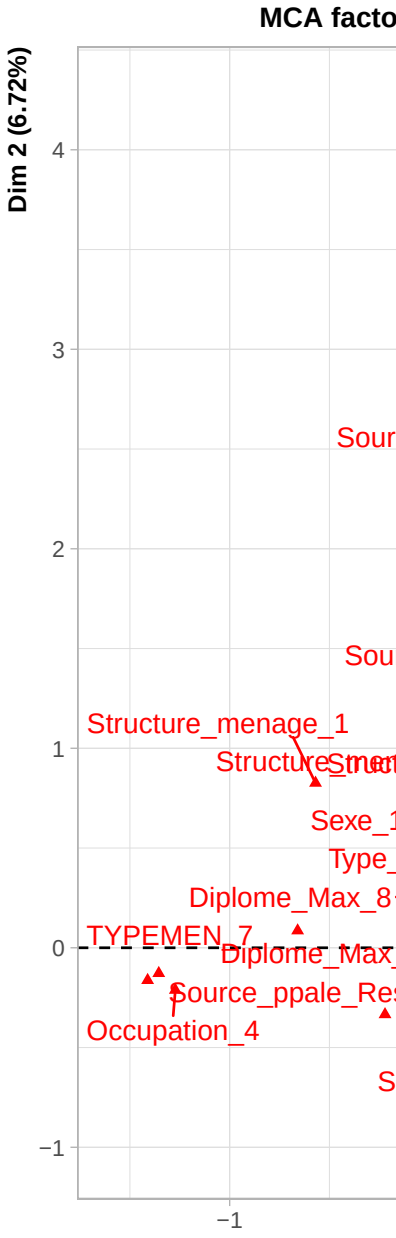

PCA graph of individuals
Dim 2 (25.88%)
Dim 1 (38.39%)
2.5
0.0
−2.5
−2
0
2
4
6


PCA graph of variables
Dim 2 (25.88%)
1.0
0.5
0.0
−0.5
−1.0
Revenus
Age
Nb_Enfants_sup_10
Nb_Enfants_inf_10
−1.0
−0.5
0.0
0.5
1.0
Dim 1 (38.39%)

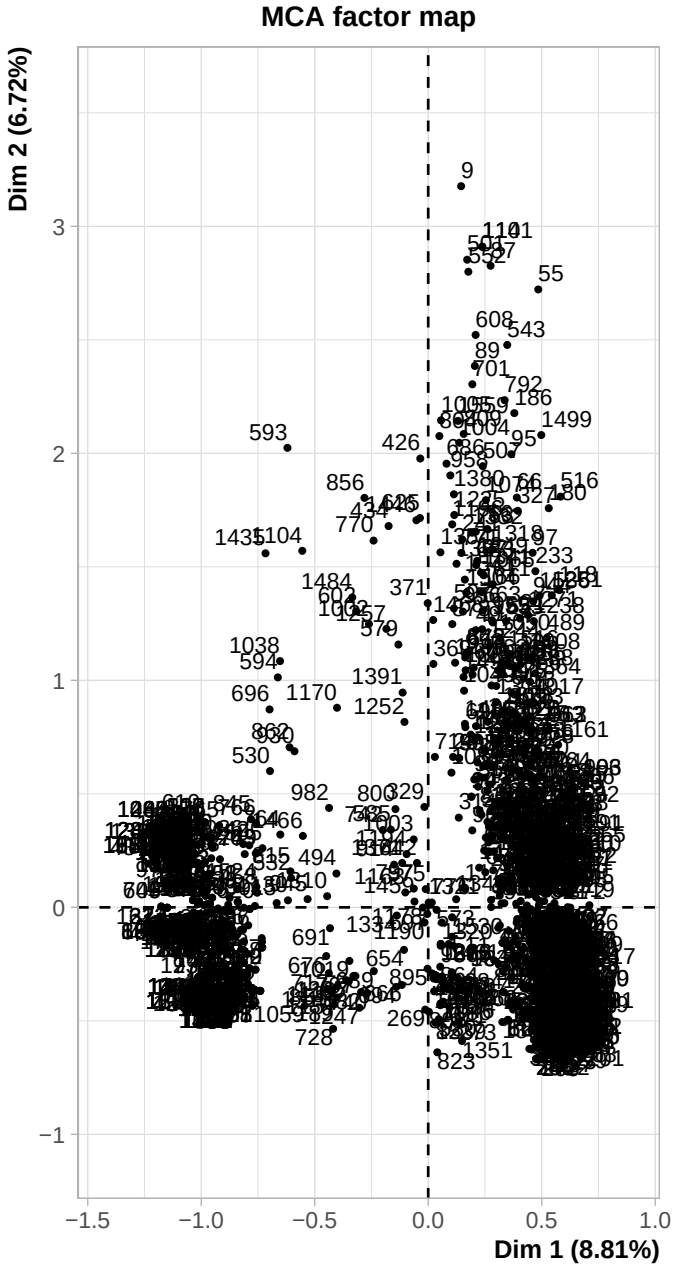


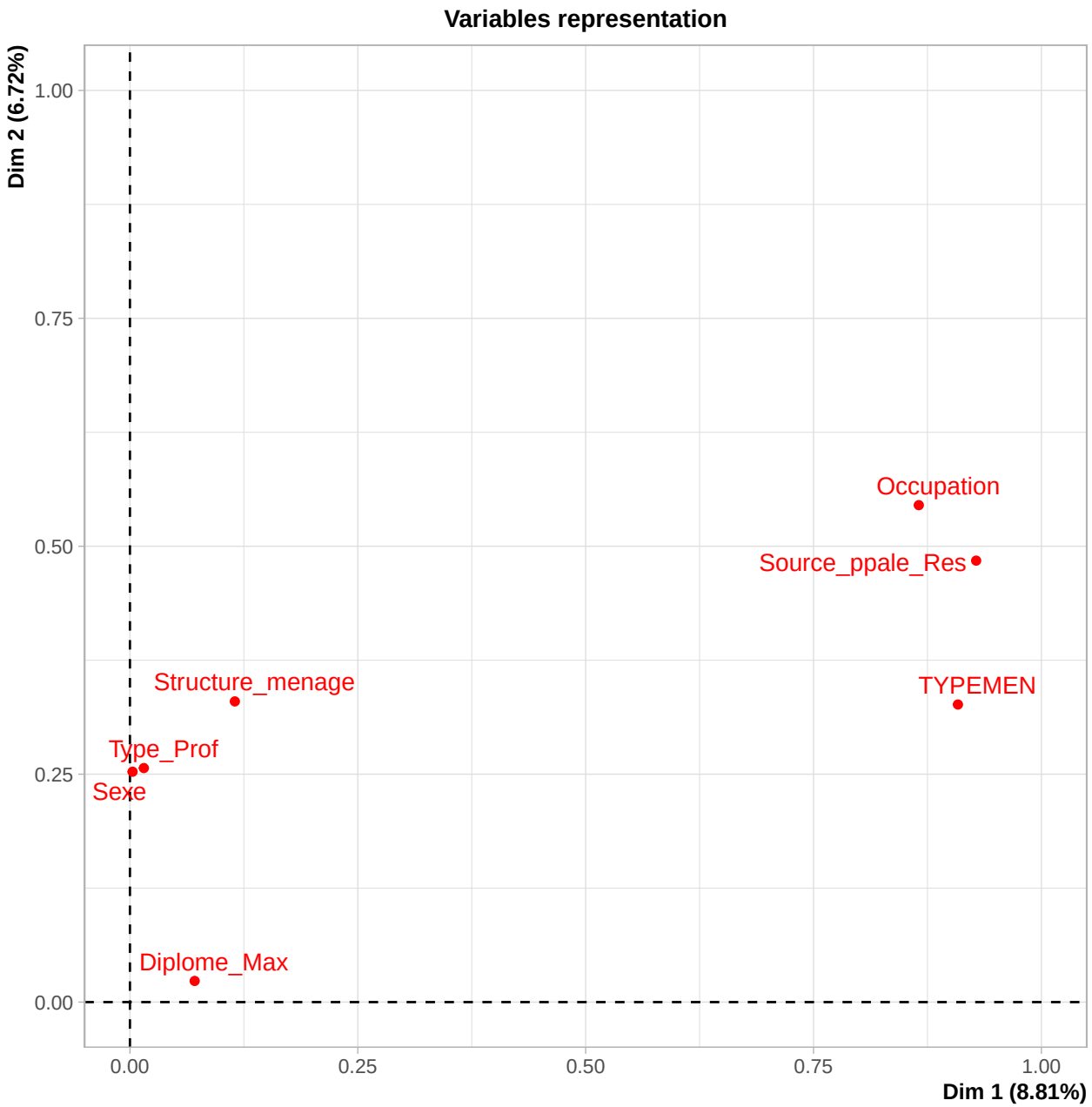
Les 2 premiers axes de l' ACP expriment 64.27% de l'inertie totale du jeu de données ; cela signifie que 64.27% de la variabilité totale du nuage est représentée dans ce plan. C'est un pourcentage assez important, et le premier plan représente donc convenablement la variabilité contenue dans une grande part du jeu de données constitué des variables numériques . Cette valeur est supérieure à la valeur référence de 52.76%, la variabilité expliquée par ce plan est donc significative (cette intertie de référence est le quantile 0.95-quantile de la distribution des pourcentages d'inertie obtenue en simulant 2 779 jeux de données aléatoires de dimensions comparables sur la base d'une distribution normale).

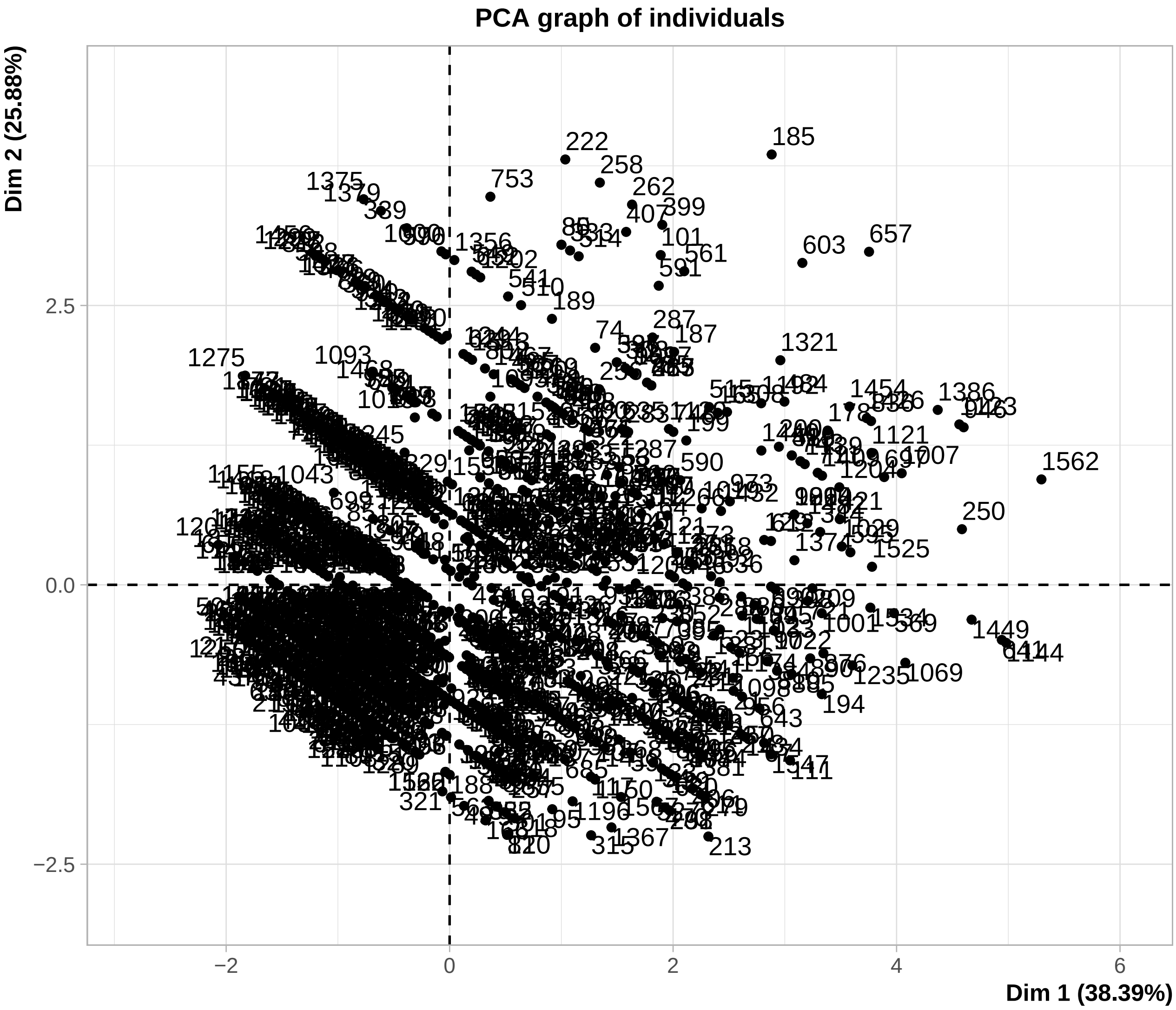
Du fait de ces observations, il serait tout de même probablement préférable de considérer également dans



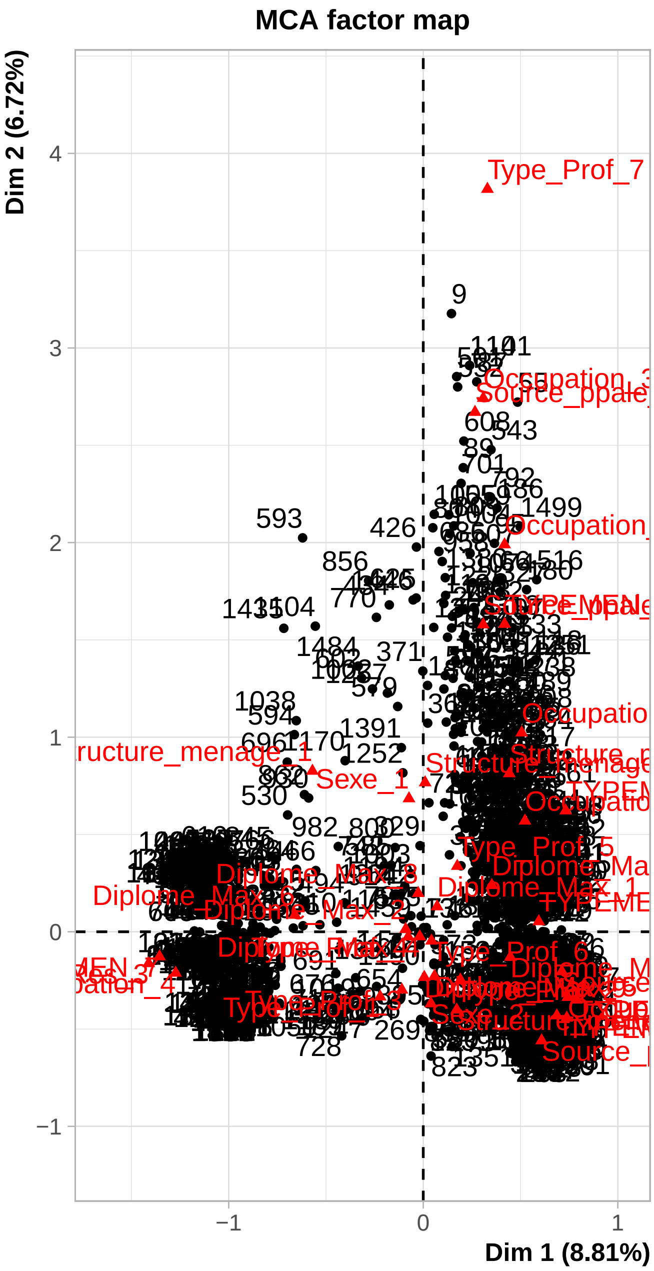
l'analyse les dimensions supérieures ou égales à la troisième.


MCA factor map
Dim 2 (6.72%)
Dim 1 (8.81%)
3
2
1
0
−1
−1.5
−1.0
−0.5
0.0
0.5
1.0


Variables representation
Dim 2 (6.72%)
1.00
0.75
0.50
0.25
0.00
Occupation
Source_ppale_Res
Structure_menage
TYPEMEN
Type_Prof
Sexe
Diplome_Max
0.00
0.25
0.50
0.75
1.00
Dim 1 (8.81%)



PCA graph of individuals
Dim 2 (25.88%)
Dim 1 (38.39%)
2.5
0.0
−2.5
−2
0
2
4
6


MCA factor map
Dim 2 (6.72%)
Dim 1 (8.81%)
4
3
2
1
0
−1
−1
0
1
Type_Prof_7