

# Confidence ellipses in HMFA applied to sensory profiles of chocolates

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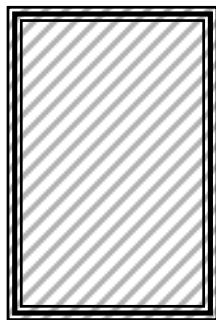
AGROCAMPUS, 65 rue de St Briec, CS 84215, 35042 Rennes cedex



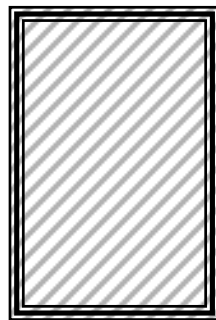
# Hierarchical Multiple Factor Analysis

## Example: problematics

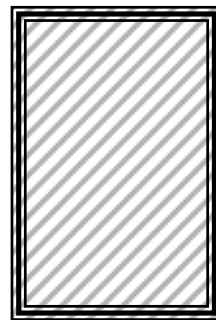
- 6 chocolates
- 14 sensory descriptors
- 2 types of panels
  - 6 trained sensory panels
  - 1 untrained panel made up of students



panel 1



(...)



panel 6

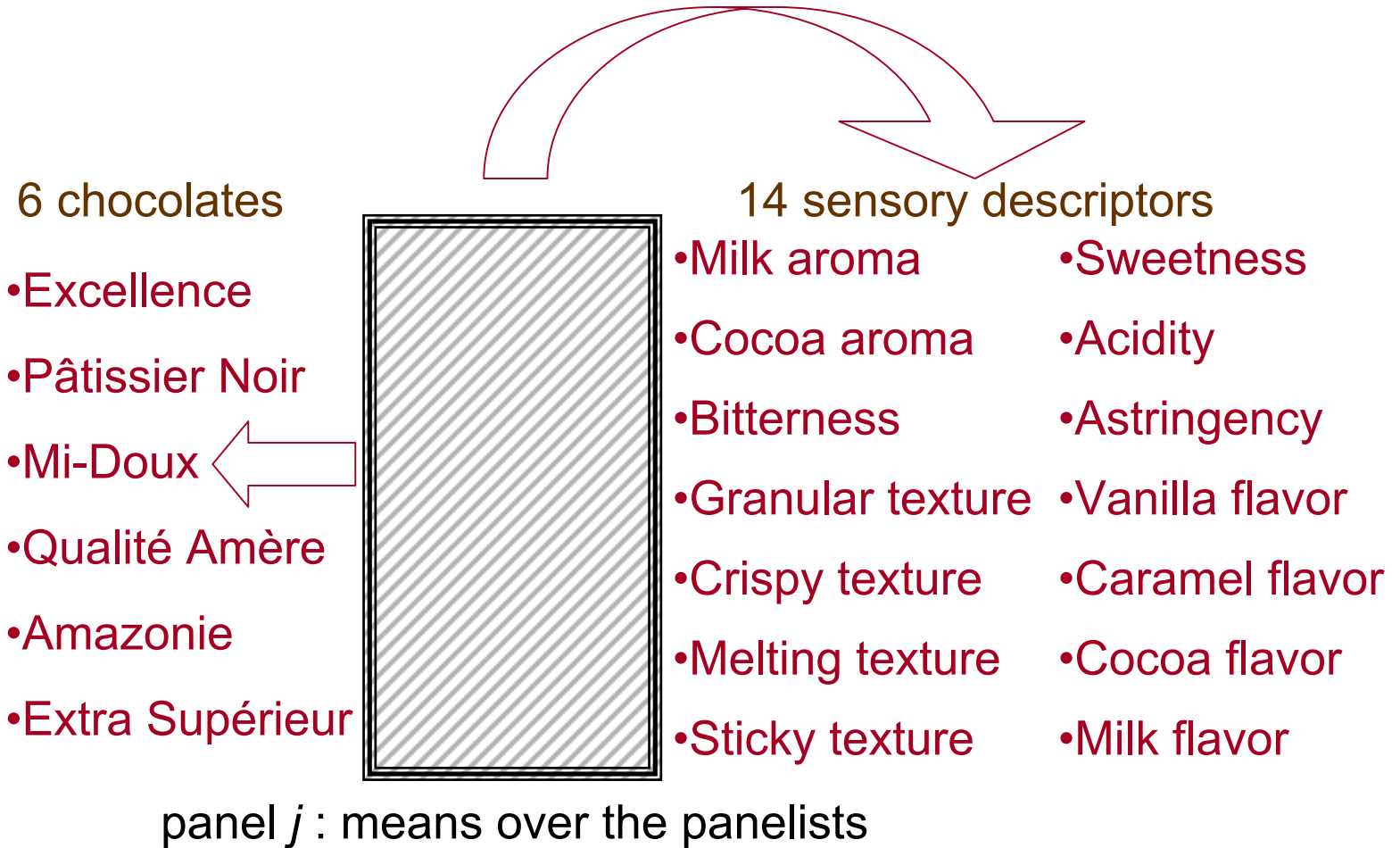


untrained panel



# Hierarchical Multiple Factor Analysis

## Example: data



# Hierarchical Multiple Factor Analysis

## Example: rules

- 6 chocolates
- 14 sensory descriptors
- 2 types of panels
  - 6 trained sensory panels
  - 1 untrained panel made up of students

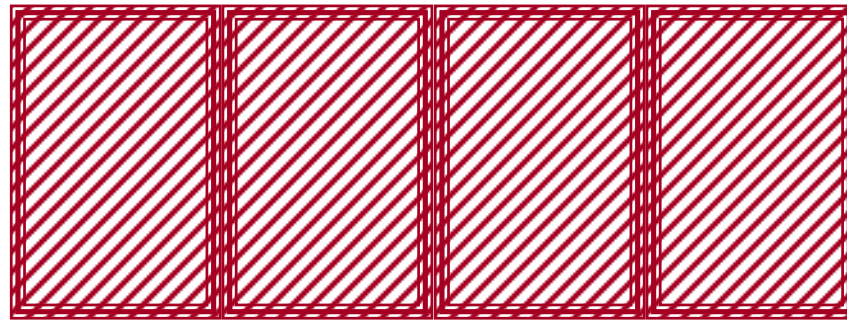
How to compare the trained panels all together with the untrained panel?

- Distinguish between each of the trained panels
- Balance their respective part

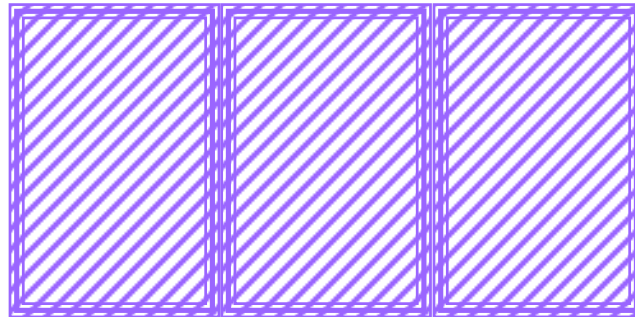


# Hierarchical Multiple Factor Analysis

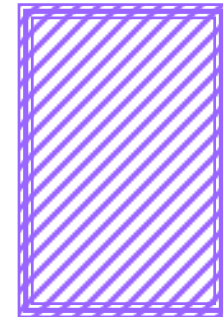
## Example



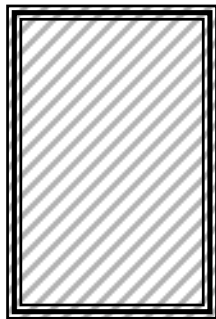
all panels mixed up



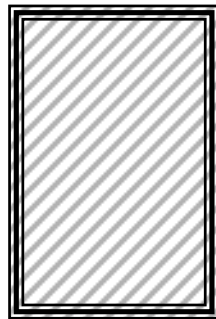
6 trained panels



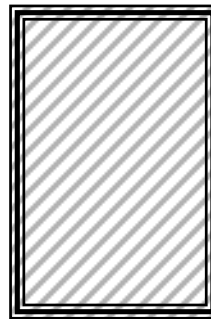
untrained panel



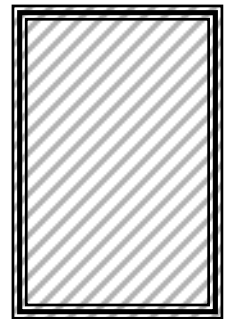
panel 1



(...)



panel 6



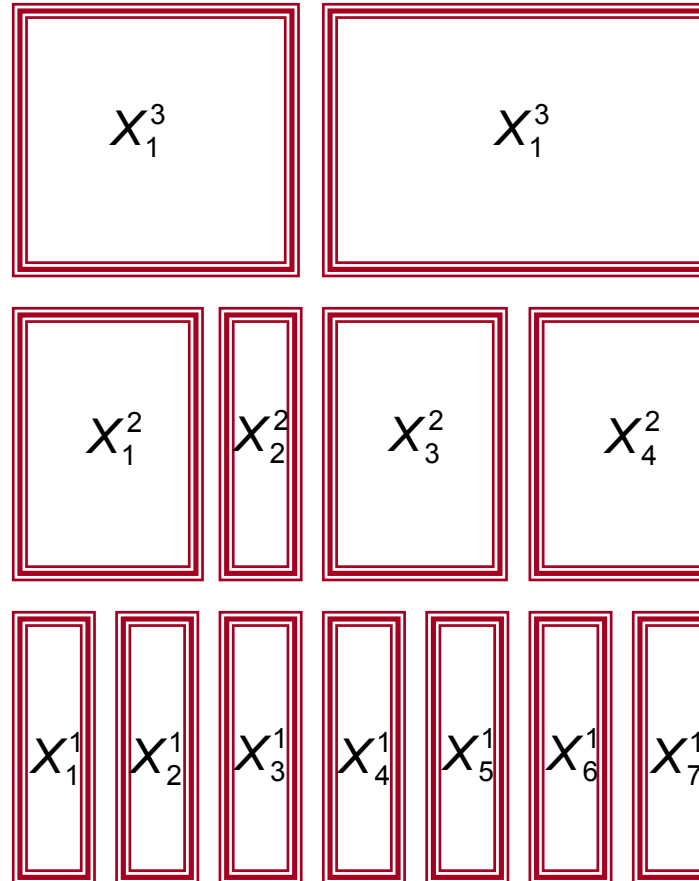
untrained panel



# Hierarchical Multiple Factor Analysis

## Data

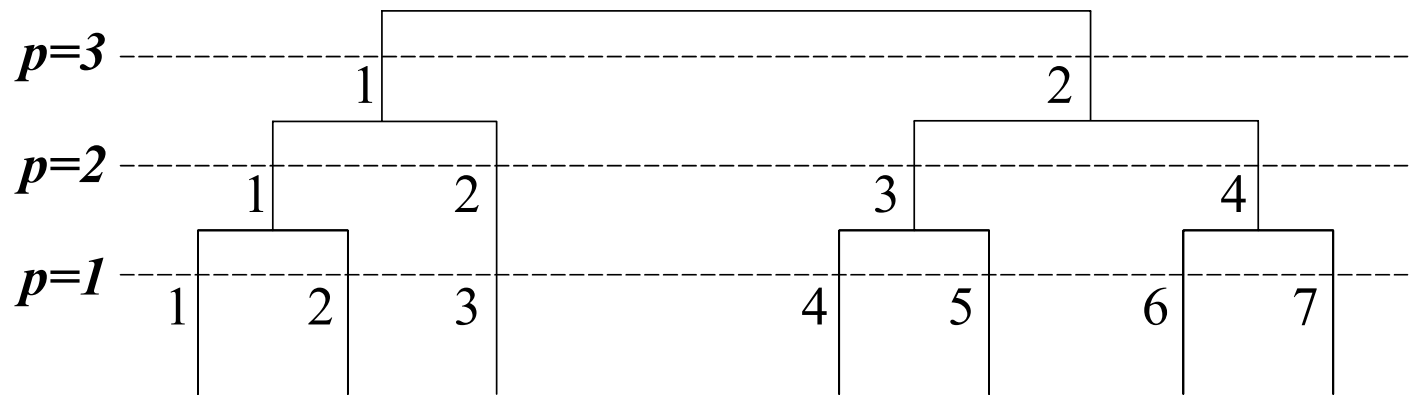
### Hierarchical MFA



Hierarchy on variables



# Hierarchical Multiple Factor Analysis Data



# Hierarchical Multiple Factor Analysis

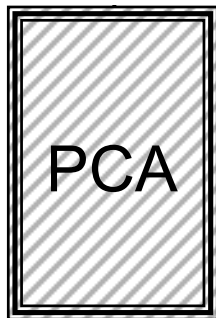
## Objectives

- To balance the part of each group, wherever the partition
- To represent each group
- To provide relevant indicators appropriate to the notion of hierarchy



# Hierarchical Multiple Factor Analysis

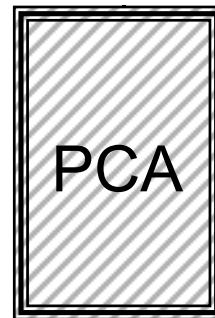
## Principle



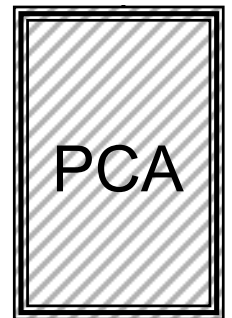
panel 1



(...)



panel 6

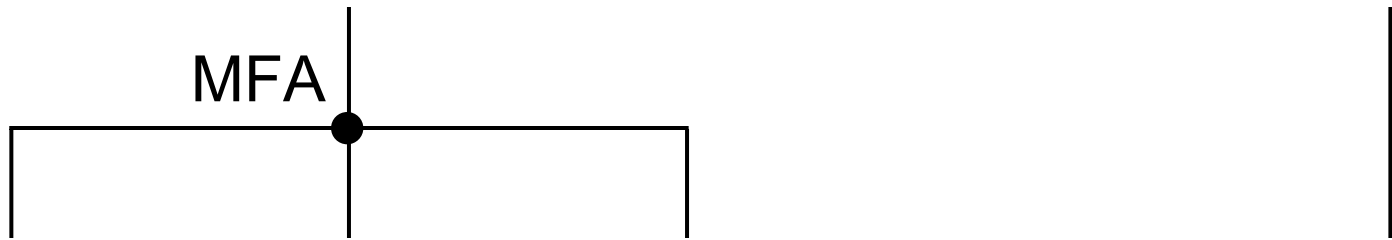


untrained panel



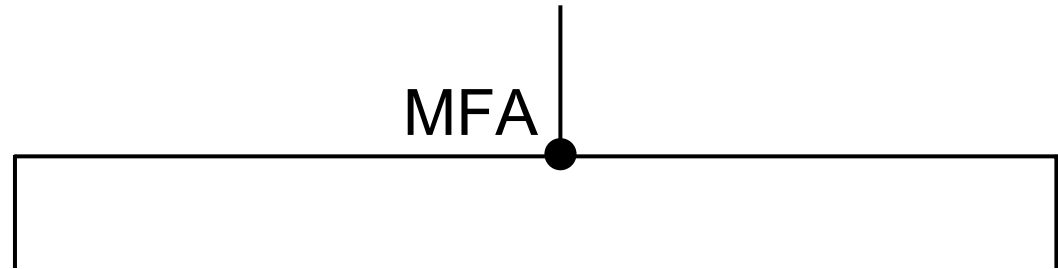
# Hierarchical Multiple Factor Analysis

## Principle



# Hierarchical Multiple Factor Analysis

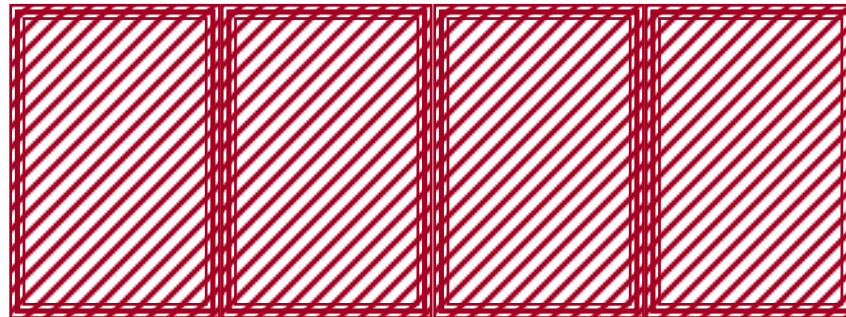
## Principle



# Hierarchical Multiple Factor Analysis

## Display of the partial individuals

- E. Supérieur

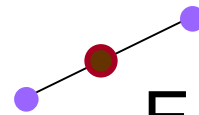


all panels mixed up

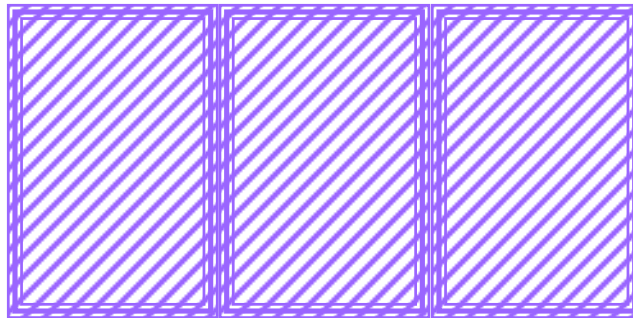


# Hierarchical Multiple Factor Analysis

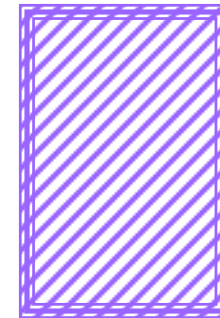
## Display of the partial individuals



E. Supérieur



6 trained panels



untrained panel



# Hierarchical Multiple Factor Analysis

## Display of the partial individuals

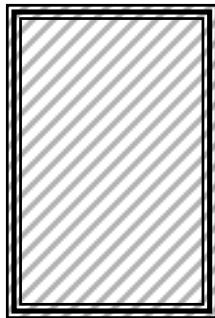
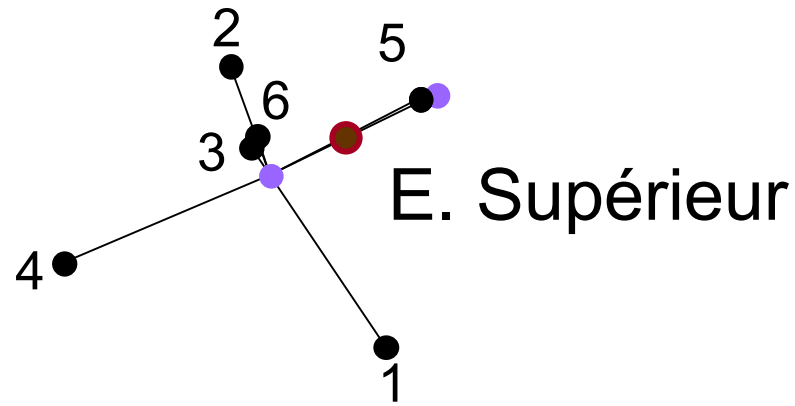


- Each individual is the center of gravity of its partial representations

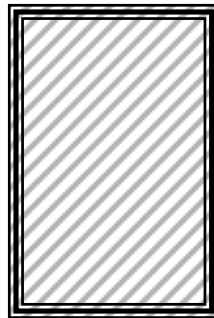


# Hierarchical Multiple Factor Analysis

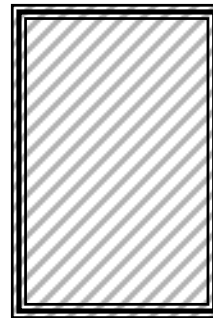
## Display of the partial individuals



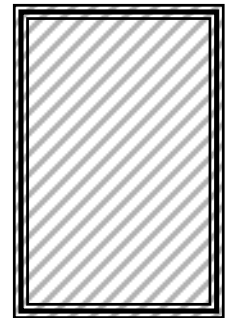
panel 1



(...)



panel 6

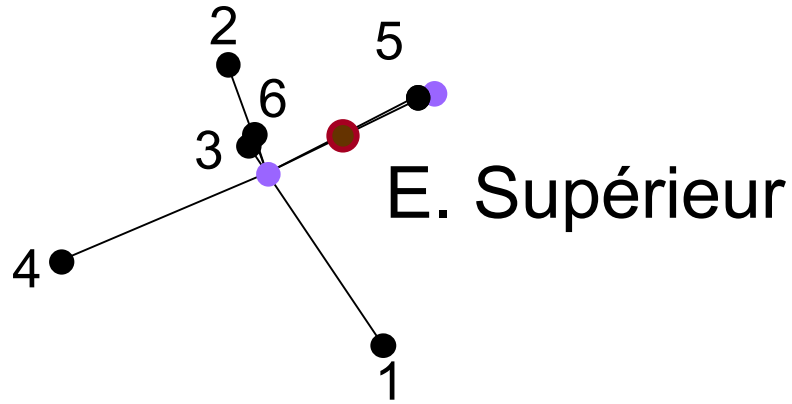


untrained panel



# Hierarchical Multiple Factor Analysis

## Display of the partial individuals

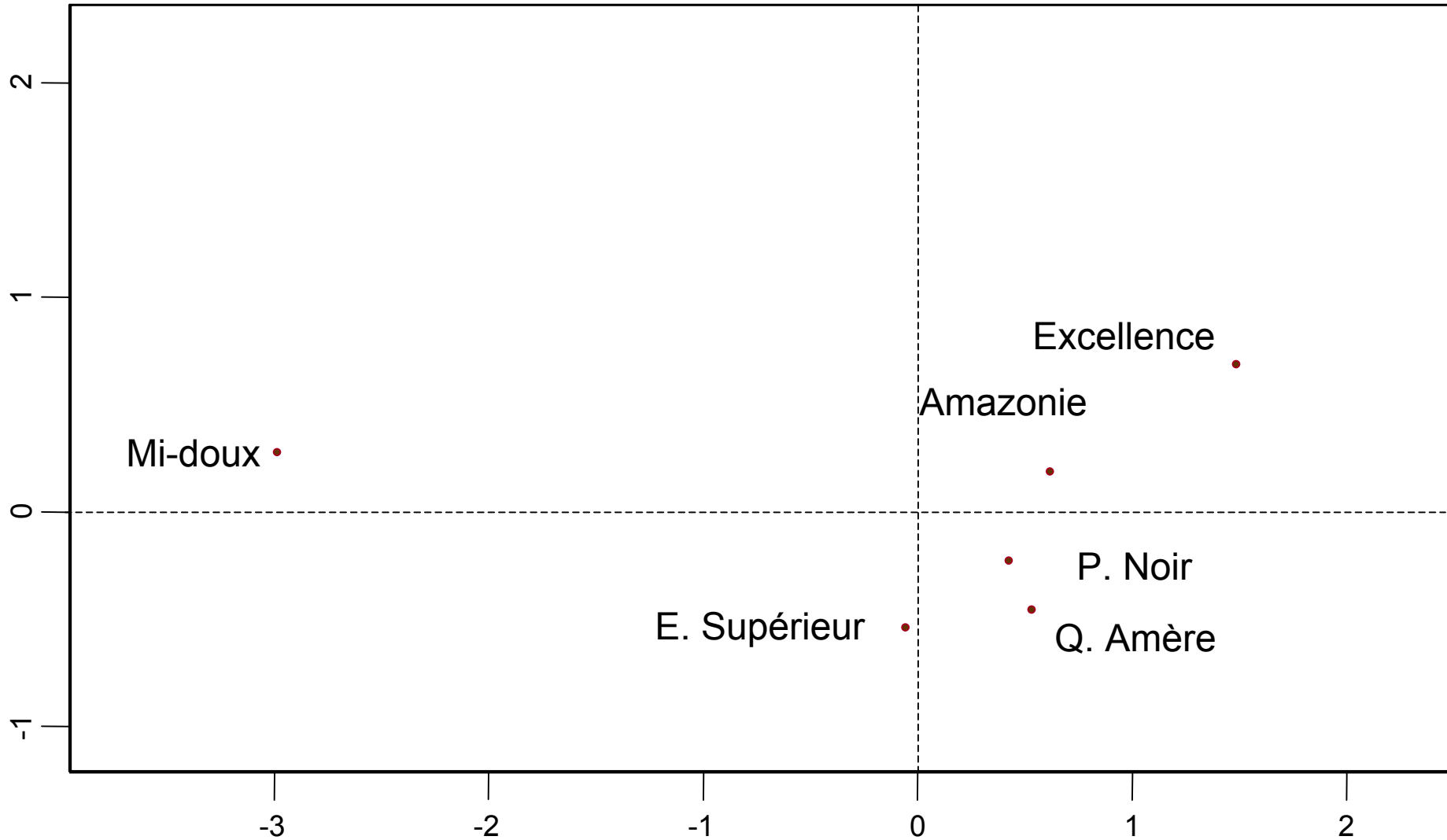


- Each partial individual associated with group  $j$  at level  $p$  is the center of gravity of its partial representations



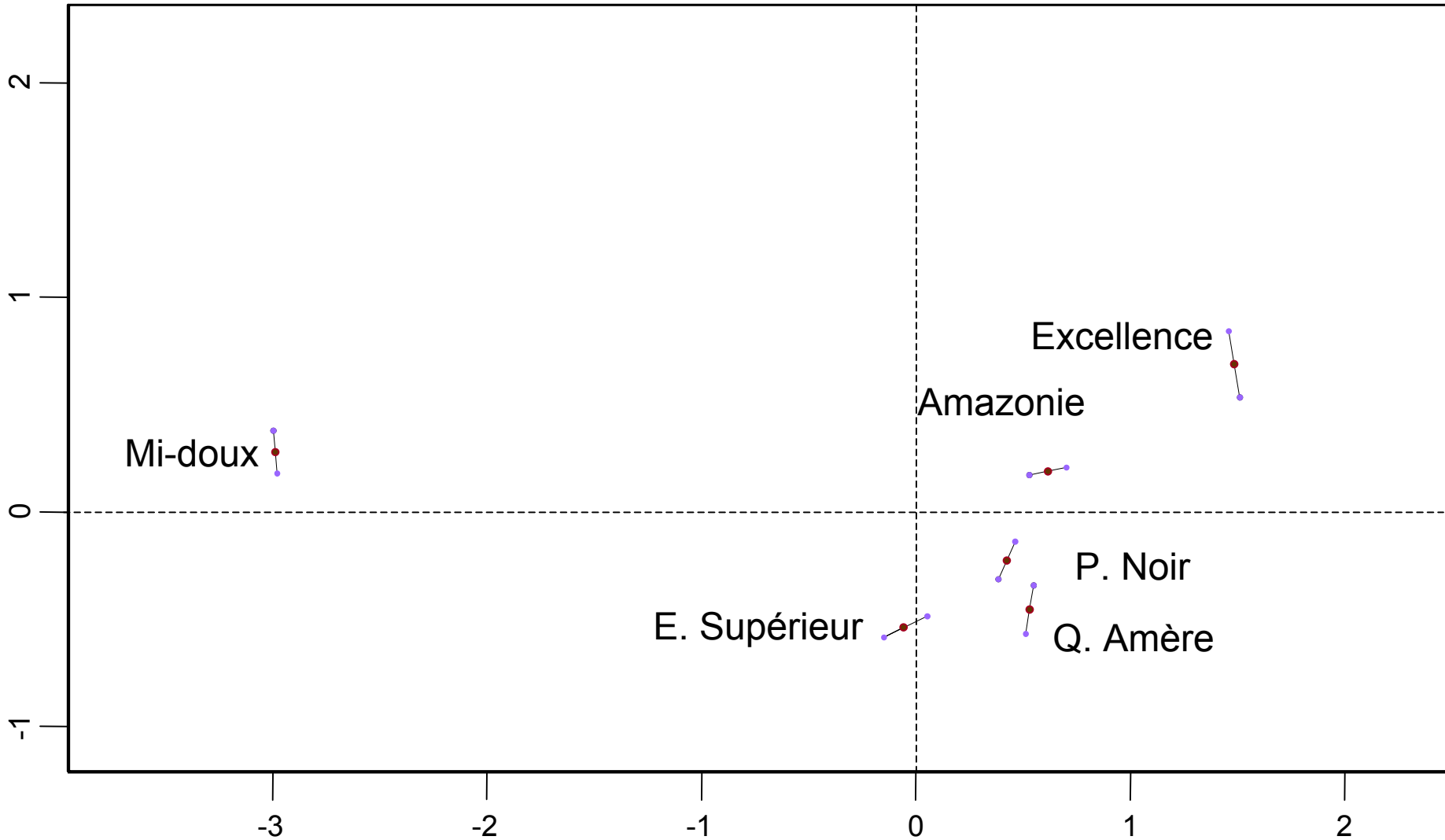
# Hierarchical Multiple Factor Analysis

## Example



# Hierarchical Multiple Factor Analysis

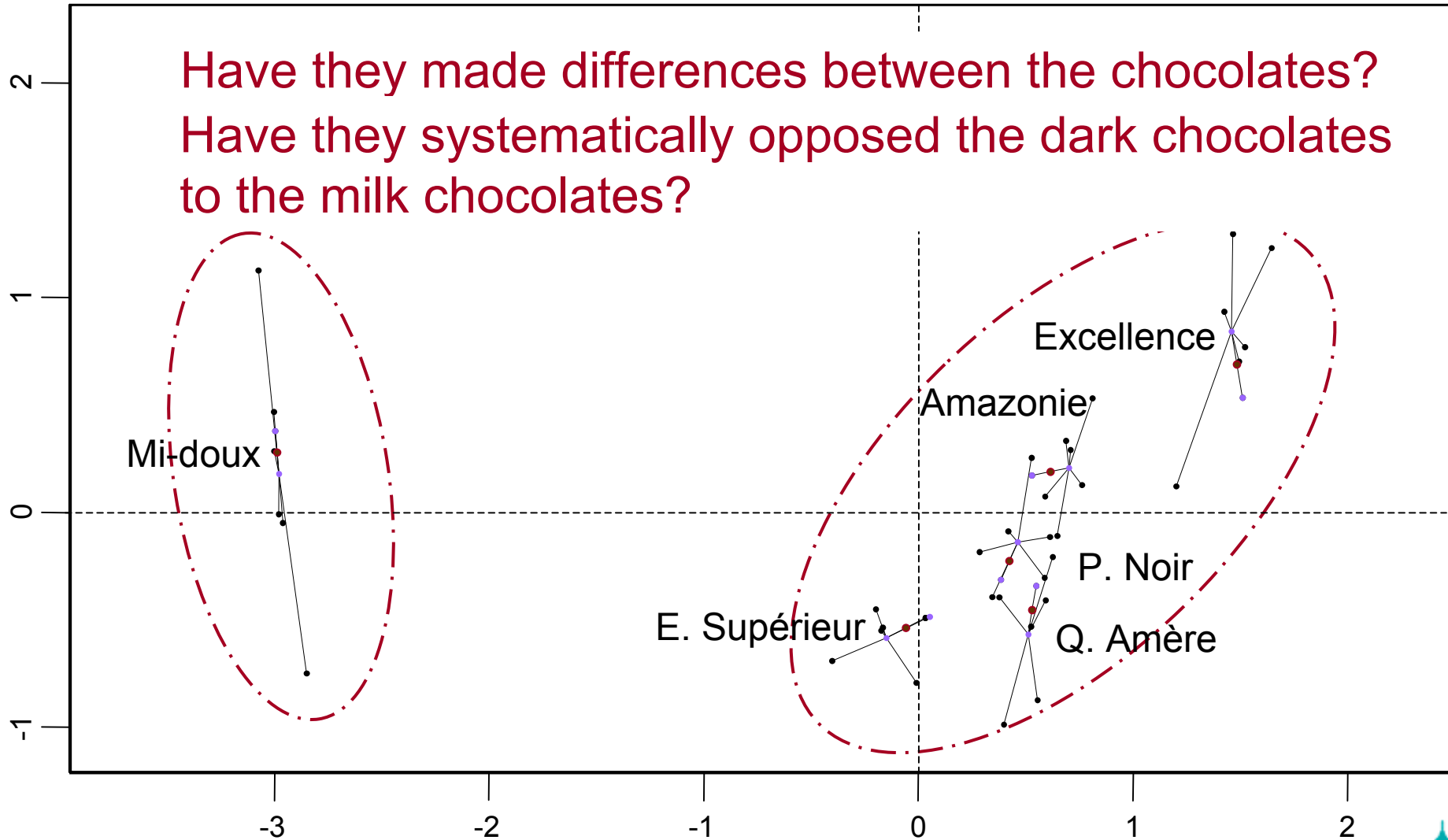
## Example



# Hierarchical Multiple Factor Analysis

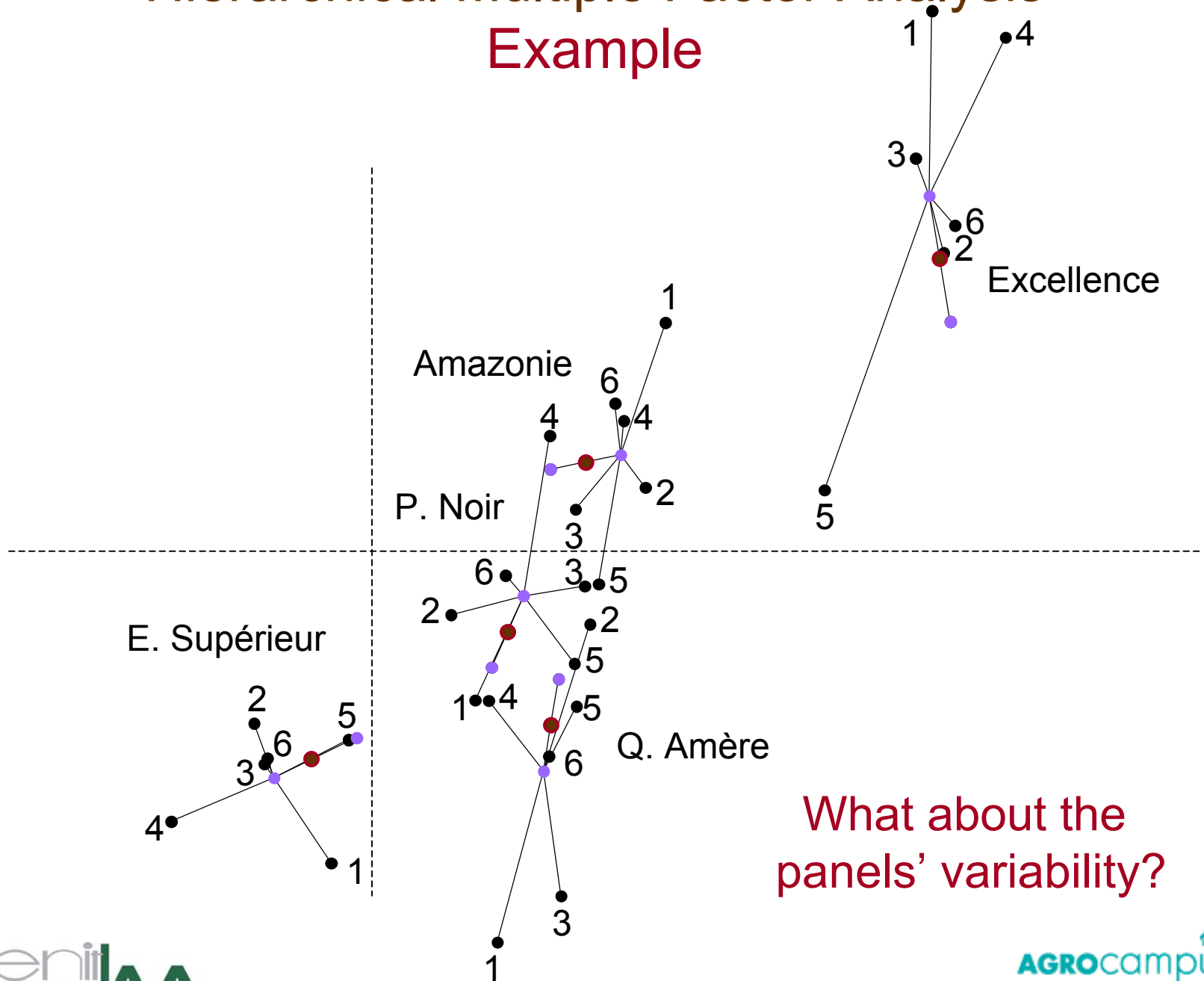
## Example

Have they made differences between the chocolates?  
Have they systematically opposed the dark chocolates to the milk chocolates?



# Hierarchical Multiple Factor Analysis

## Example



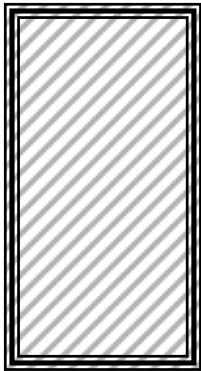
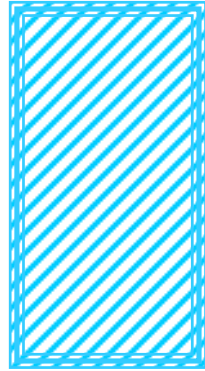
What about the panels' variability?



# Hierarchical Multiple Factor Analysis

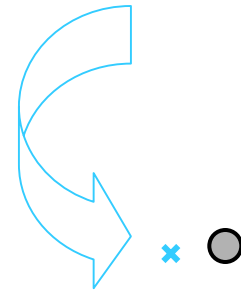
## Confidence ellipses

panel  $j$  altered



panel  $j$

Center of gravity  
of panelists' scores



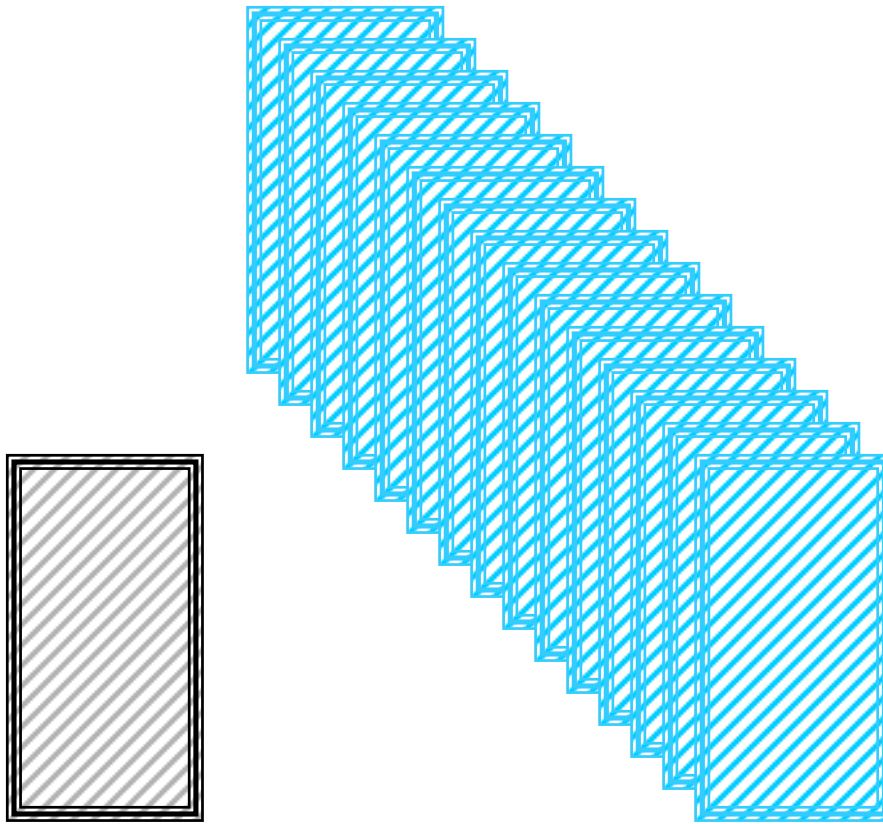
- 1) Drawing lots
- 2) Projection of each panelists' judgement
- 3) New representation



# Hierarchical Multiple Factor Analysis

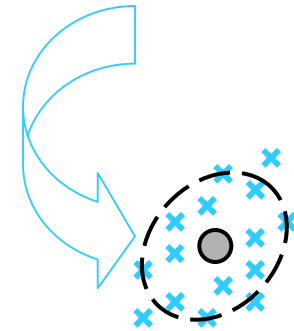
## Confidence ellipses

panel  $j$  altered



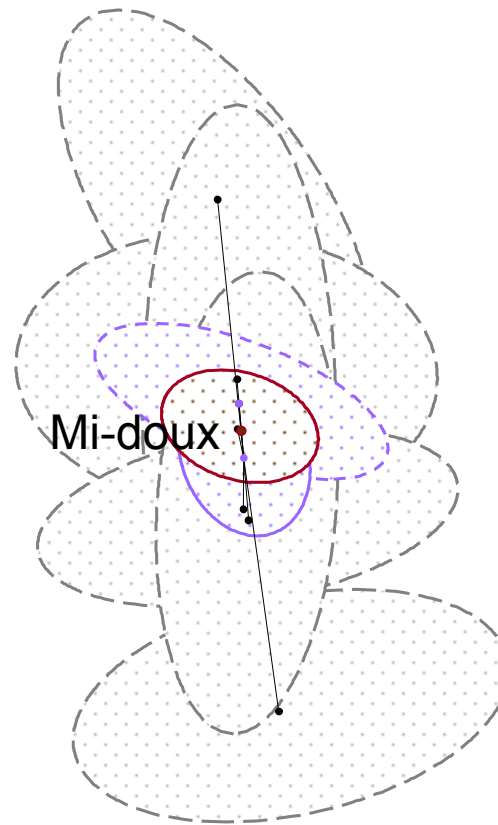
panel  $j$

Center of gravity  
of panelists' scores



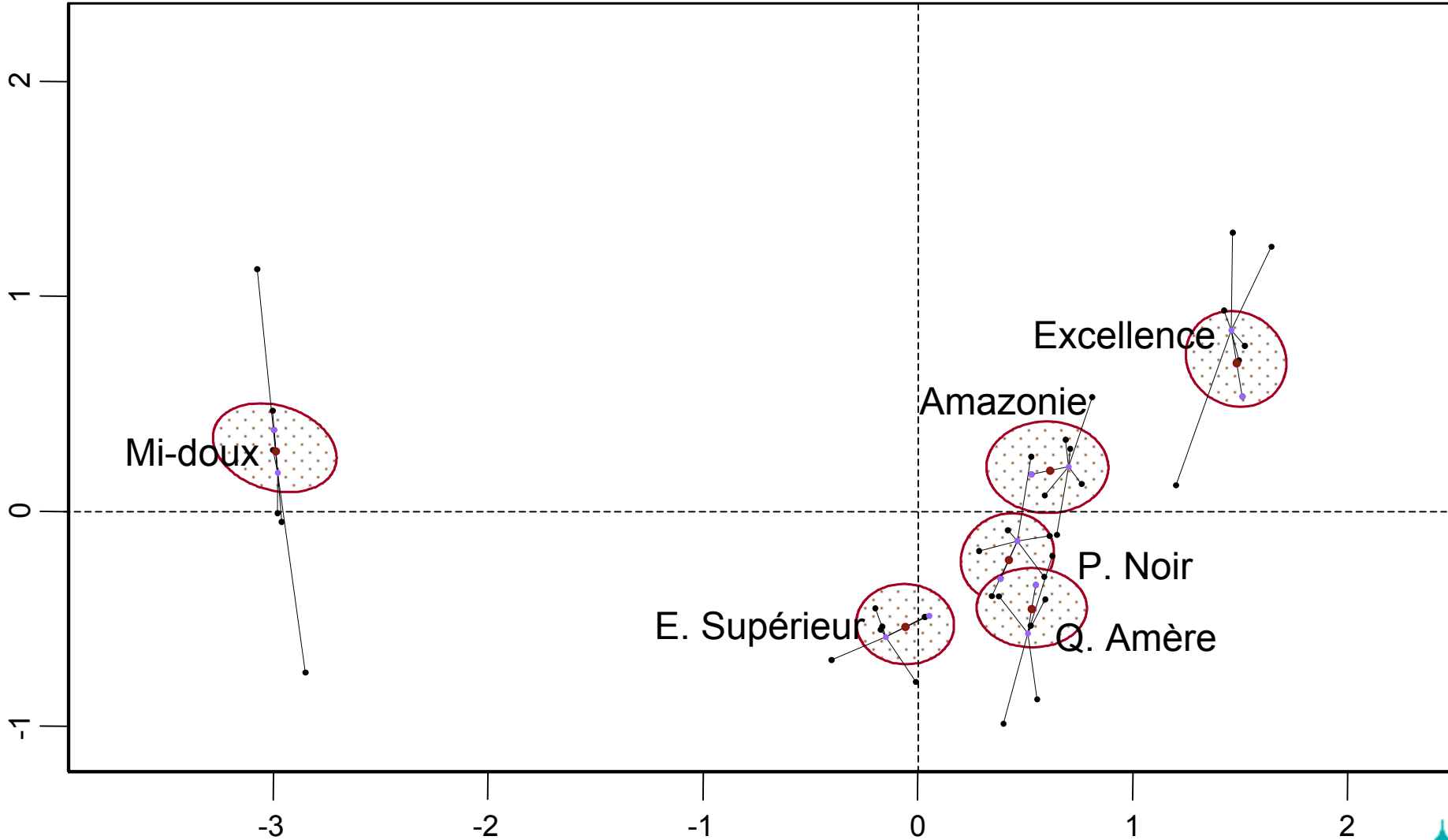
# Hierarchical Multiple Factor Analysis

## Confidence ellipses



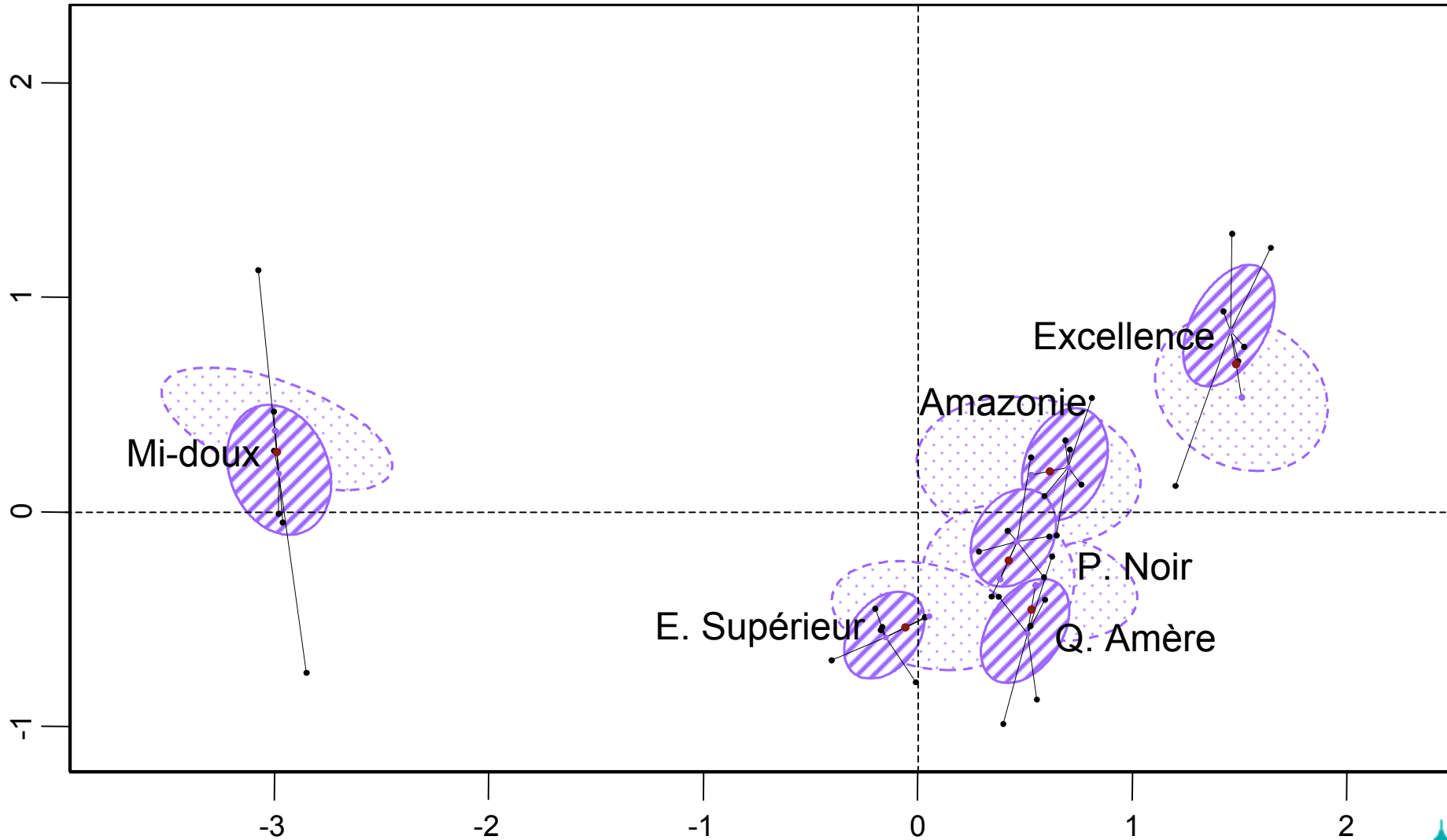
# Hierarchical Multiple Factor Analysis

## Confidence ellipses



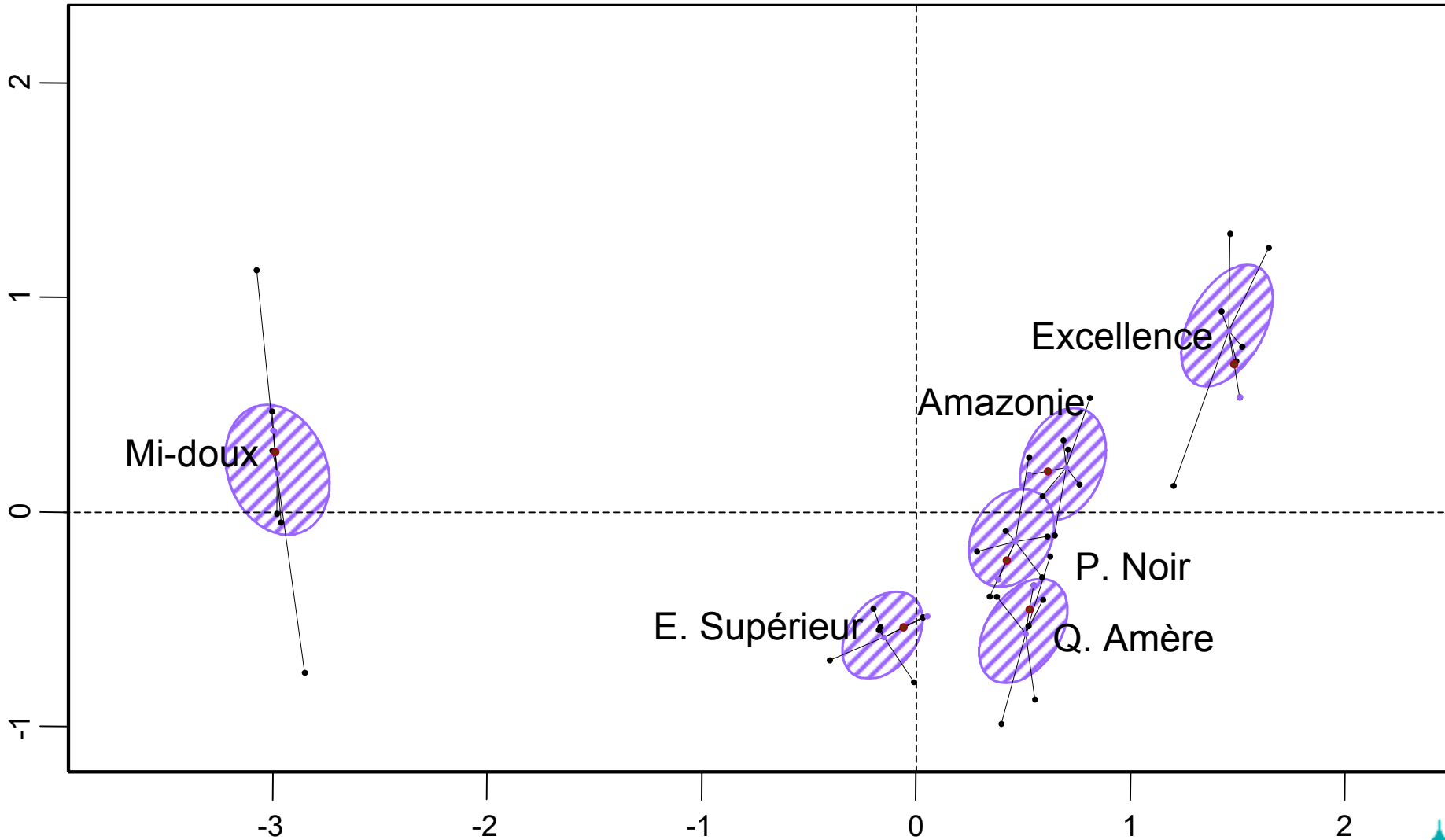
# Hierarchical Multiple Factor Analysis

## Confidence ellipses



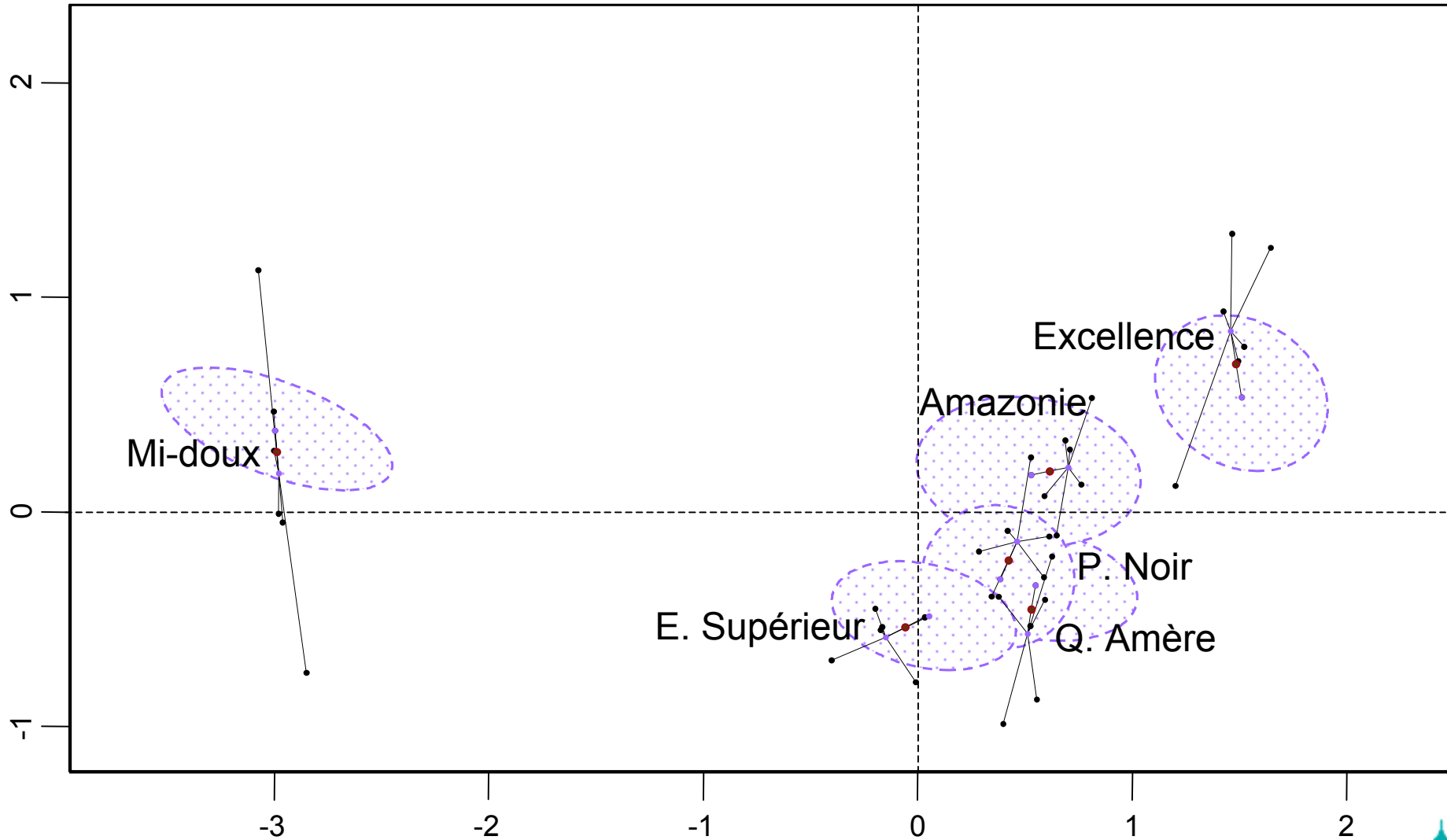
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## Confidence ellipses



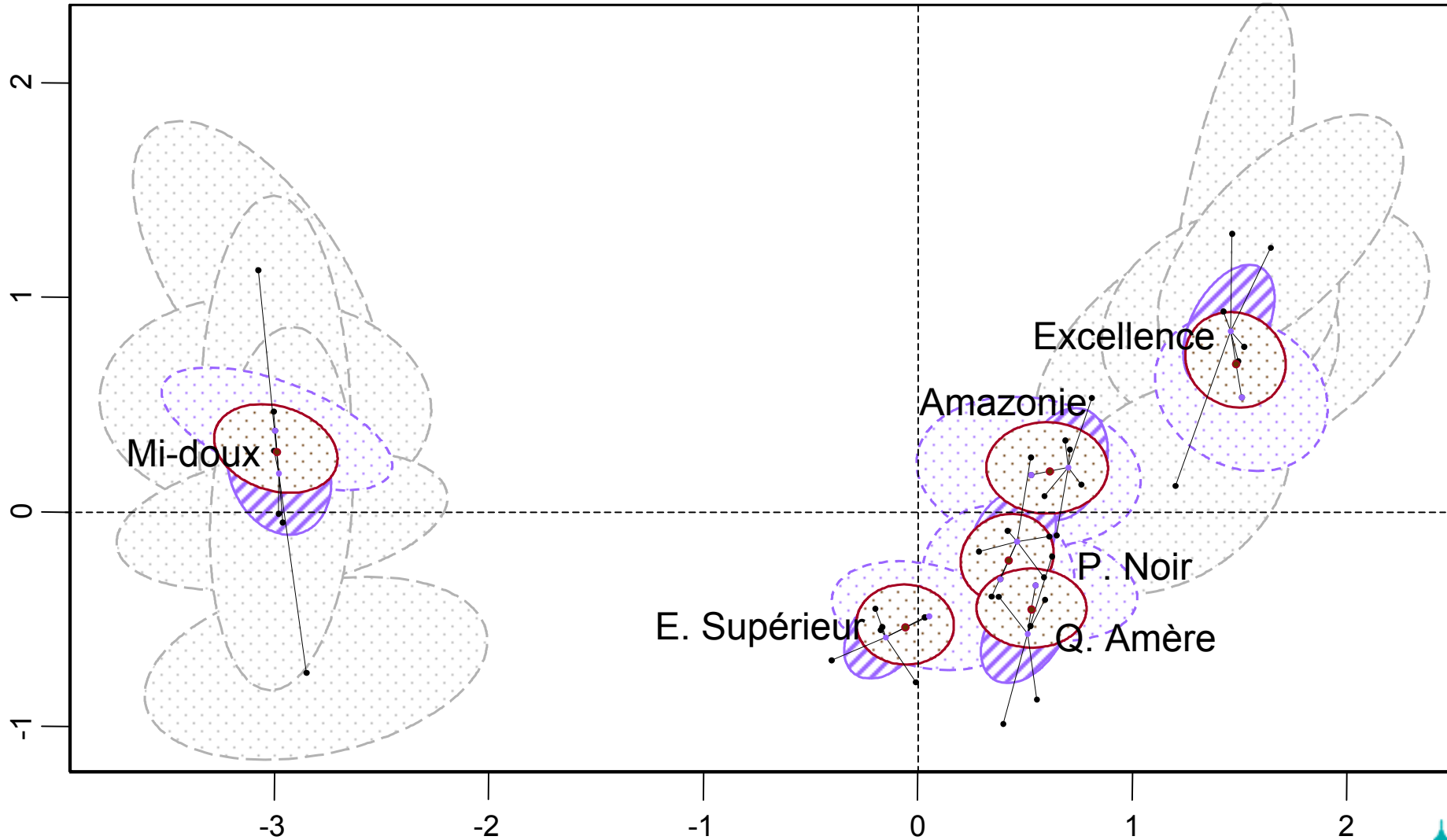
# Hierarchical Multiple Factor Analysis

## Confidence ellipses



# Hierarchical Multiple Factor Analysis

## Confidence ellipses



# Hierarchical Multiple Factor Analysis

## Conclusion

- Hierarchies are everywhere
  - Partial individuals + ellipses =
- enriched information
- challenge

