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The Evolution of Immigrant Groups in Luxembourg

A Symbolic Data Analysis Approach

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Contextualization

Immigration in Luxembourg dates back to the late 19th.

More than 50% of people born abroad.

Main reason for immigration: Employment.

Luxembourgish labour market highly internationalised.

Objectives

1. What differentiates the most the different immigrant groups in the labour market?
2. Split the population into homogeneous groups and characterize their profiles in the labour market.
3. Portray the groups' changes over time.

This allows the **identification of disparities** in employment and earnings which may help identifying areas that may require additional support.

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Data

Data Source: Luxembourgish Labour Force Survey

Period covered: 2014 to 2022

Variables: EU-LFS variables + two variables from the National LFS

Cohort: the employees (90% of the labour force)

Methodology

Symbolic Data Analysis

A framework concerned with the analysis of data that exhibit inherent variability.

Cluster Analysis

To group the Symbolic Objects homogeneously.

Heuristic Identification of Noisy Variables algorithm

To select the variables with maximal cluster information.

Monitoring the Evolution of Clusters (MEC) Framework

To portray changes over time.

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Data Preparation

1. **Pre-processing** micro-data: discretization, handling missing values,...

2. Variables **YEARESID**[1] and **COUNTRYB**[2] were selected in order to aggregate microdata.

3. **21 symbolic objects** were created.

4. Primarily described by **16 modal variables**.

Extract of a symbolic data table for the year 2022

	$H	DEGURBA	1	2	3	$H	TELEARB	1	2
1.EU	$H	3	0.553	0.250	0.197	$H	2	0.671	0.329
1.NC	$H	3	0.360	0.297	0.342	$H	2	0.559	0.441
1.OUTEU	$H	3	0.505	0.351	0.144	$H	2	0.629	0.371
1.PT	$H	3	0.258	0.548	0.194	$H	2	0.194	0.806
2.EU	$H	3	0.582	0.227	0.191	$H	2	0.755	0.245
2.NC	$H	3	0.403	0.371	0.226	$H	2	0.556	0.444
2.OUTEU	$H	3	0.325	0.423	0.252	$H	2	0.447	0.553
2.PT	$H	3	0.188	0.562	0.250	$H	2	0.250	0.750
3.EU	$H	3	0.430	0.289	0.281	$H	2	0.659	0.341
3.NC	$H	3	0.297	0.338	0.366	$H	2	0.538	0.462
3.OUTEU	$H	3	0.194	0.510	0.296	$H	2	0.276	0.724
3.PT	$H	3	0.028	0.697	0.275	$H	2	0.073	0.927
4.EU	$H	3	0.382	0.324	0.294	$H	2	0.647	0.353
4.NC	$H	3	0.333	0.300	0.367	$H	2	0.575	0.425
4.OUTEU	$H	3	0.143	0.520	0.337	$H	2	0.245	0.755
4.PT	$H	3	0.047	0.581	0.372	$H	2	0.047	0.953
5.EU	$H	3	0.340	0.298	0.362	$H	2	0.532	0.468
5.NC	$H	3	0.106	0.440	0.454	$H	2	0.333	0.667
5.OUTEU	$H	3	0.192	0.449	0.359	$H	2	0.231	0.769
5.PT	$H	3	0.066	0.497	0.437	$H	2	0.093	0.907
6.LU	$H	3	0.084	0.398	0.518	$H	2	0.237	0.763

[1]Duration of stay in Luxembourg in completed years. 1: 0 ≤ YEARESID < 4; 2: 4 < YEARESID ≤ 8; 3: 8 < YEARESID ≤ 15; 4: 15 < YEARESID ≤ 24; 5: YEARESID > 24; 6: Born in Luxembourg.
[2]Place of Birth. LU: From Luxembourg; PT: From Portugal; NC: From a neighbour country; EU: From an EU country (excluding above); OUTEU: From a non-EU country.

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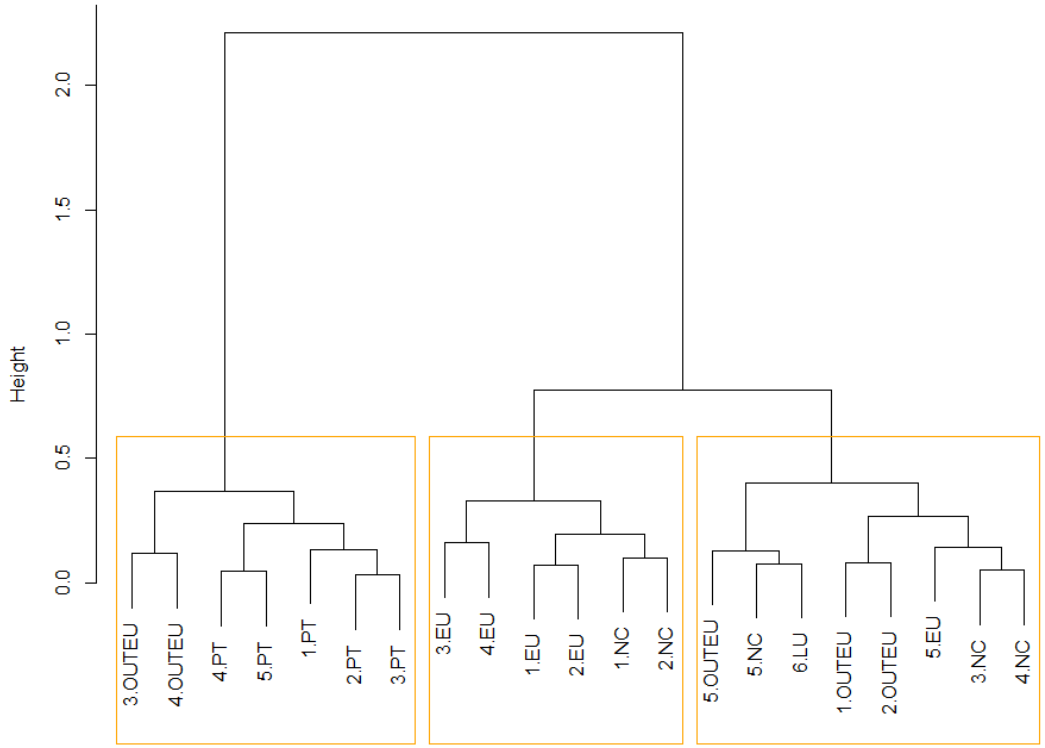
Results

1. **For each year the HCLUST algorithm was applied.**
2. Based on the dendrograms and three validity indices - Silhouette, Index G2 and Index G3 - a partition into *k* clusters was selected.
3. Cluster descriptions were obtained.
4. Cluster Monitoring.



Dendrogram 2015

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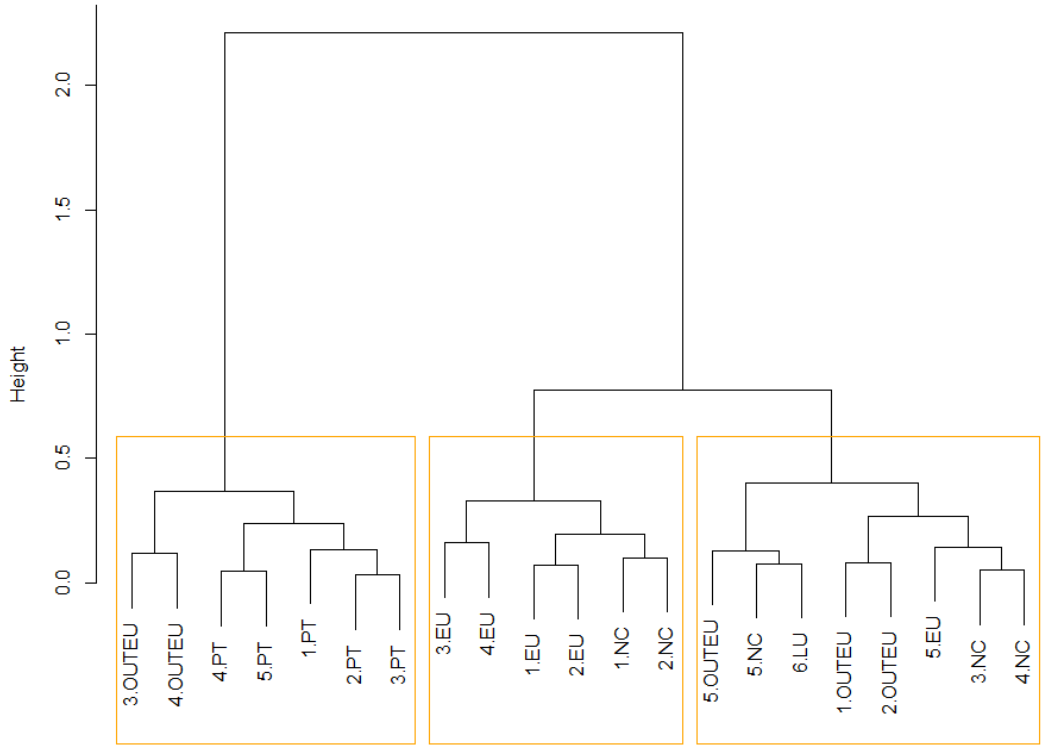

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		Cluster		
		1	2	3
TELEARB	Yes	0.597	0.131	0.264
	No	0.403	0.869	0.736
ISCO4D	White-collar high-skilled professions	0.831	0.267	0.573
	White-collar low-skilled professions	0.094	0.169	0.178
	Blue-collar high-skilled professions	0.018	0.161	0.078
	Blue-collar low-skilled professions	0.056	0.403	0.171
HATLEVEL	High School	0.197	0.786	0.541
	Bachelor	0.224	0.096	0.201
	Master/PhD	0.579	0.119	0.258
NACE3D	Agriculture	0.000	0.003	0.003
	Industry	0.030	0.047	0.053
	Construction	0.014	0.204	0.059
	Trade, transport and hospitality	0.164	0.228	0.174

Extract of Cluster Descriptions - 2022

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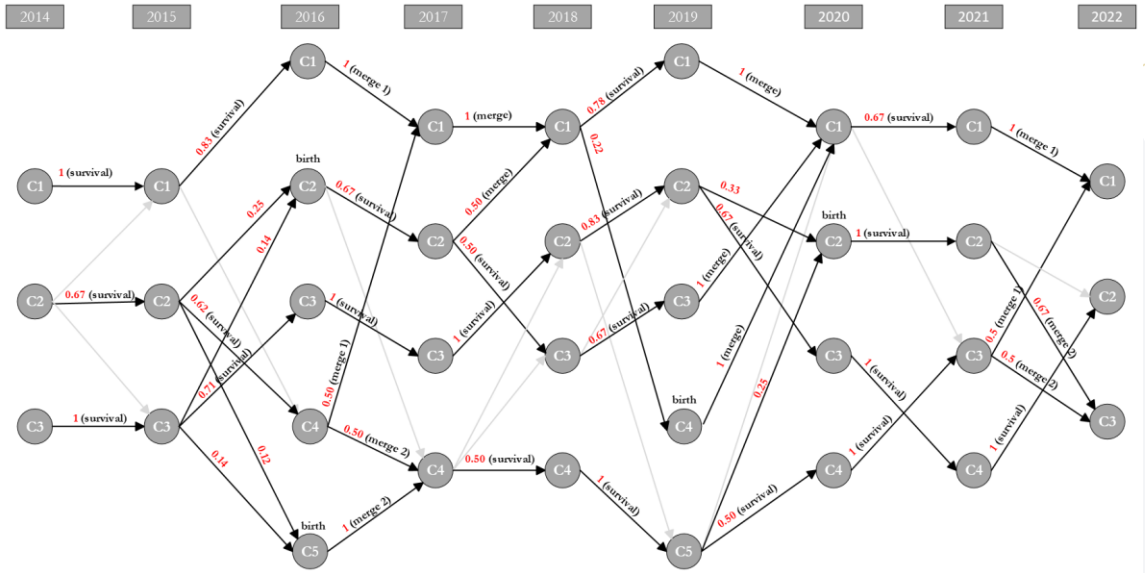

Cluster Monitoring Graph 2014-2022

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Results

- The objects were getting closer until the Brexit and the Pandemic.
- 7/9 years the Portuguese groups are together. Sometimes they are alone, other times they are together with some OUTEU groups.
- 1.EU, 2.EU, 3.EU, 4.EU, 1.NC, 2.NC, 3.NC, 4.NC groups tend to be together in the same cluster
- 5.NC and 6.LU are always in the same cluster. The 5.EU group is also in the same cluster as these two groups in 7 out of 9 years
- OUTEU groups are more spread out across clusters and move more.

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Final Considerations

- The Luxembourgish population was split and different profiles were identified.
- Some of the conclusions are in line with existing research, while others were new. For example, the importance of the degree of urbanization to split the population.
- Use of a methodology with advantages in Official Statistics that is not yet widely used.
- Accounting for time which revealed some changes that might be occurring.

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