GLOBAL INTERACTIONS BETWEEN UNIVERSITIES AND COMPANIES: an evaluation based on the Multiple Correspondence Analysis Method

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Introduction

- This article is a result of a research project that aims to capture the dimensions of global innovative and networked enterprises in developed and developing countries.
- Data regarding the interaction between universities and companies, amongst other, were obtained, taking into consideration their national or global amplitude.

Introduction

- Data come from a survey conducted in South Africa, Germany, Brazil, China, Denmark, Estonia, Norway and Sweden.
- In the core of what this essay aims at, these data were used to characterize the companies of the sample and their interactions with the university system.
- The statistic multivariate method of Multiple Correspondence Analysis was used in order to analyze these data.

Multiple Correspondence Analysis

- The Multiple Correspondence Analysis (MCA) is a multivariate statistical method that allows to verify the association between more than two categorical variables.
- This technique aims mainly at transforming qualitative information available in a table in an instrumental chart, in order to make the analysis of data easier (GRENACRE, 1994).
- The analysis of these observations, described by a set of variables and their categories, will occurs by reducing the dimensionality of the system so that information can be systematized in a plane (GRENACRE, 1994).

Multiple Correspondence Analysis

- The Multiple Correspondence Analysis serves to reduce the dimensions required for graphic display of a set of variables.
- The proximity of the analyzed categories in the correspondence chart will determine the association between them.
- This association is used as the basis for the identification of profiles containing the elements of the sample.

ANALYSIS FEATURING THE EIGHT SAMPLE COUNTRIES

- Each country had a dedicated sector of focus: ICT, Automotive or Agro-processing.
- Agro-processing: South Africa and Denmark
- Automotive: Brazil, Germany and a small sample from Sweden
- ICT: India, China, Sweden, Norway and Estonia

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ANALYSIS FEATURING THE EIGHT SAMPLE COUNTRIES

- Variables: Country; Type of Enterprise (standalone company, MNC-Headquarter, MNC-subsidiary); existence of R&D; main source of technology; Internationalization (R&D and production activities); Interaction (foreign and local universities); Formal and Informal interaction with foreign universities.
- Each variable is displayed on the chart as a point with a specific color.

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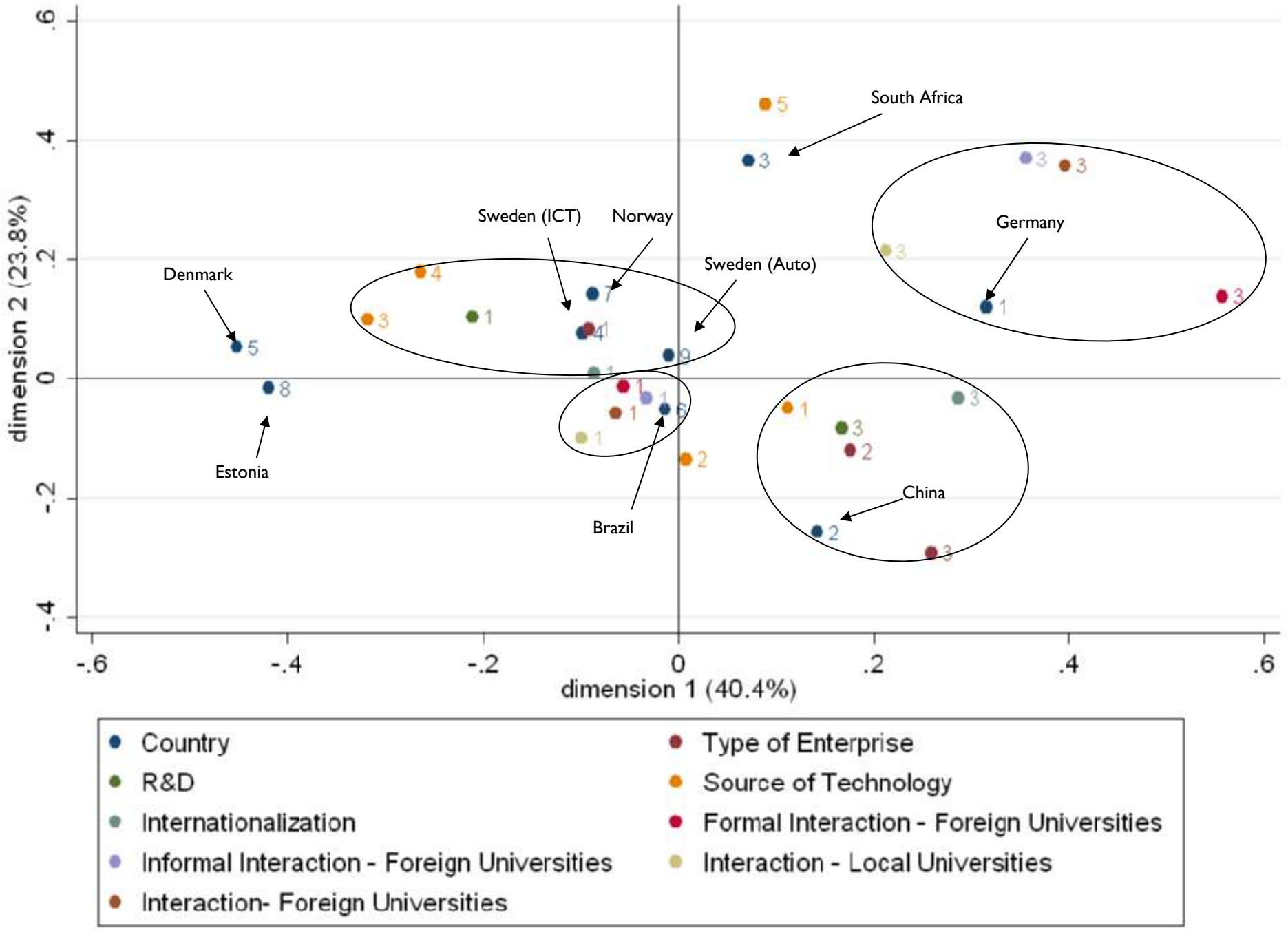

South Africa
Sweden (ICT)
Norway
Germany
Sweden (Auto)
Denmark
Estonia
Brazil
China
dimension 2 (23.8%)
dimension 1 (40.4%)
-.6
-.4
-.2
0
.2
.4
.6
Country
R&D
Internationalization
Informal Interaction - Foreign Universities
Interaction- Foreign Universities
Type of Enterprise
Source of Technology
Formal Interaction - Foreign Universities
Interaction - Local Universities

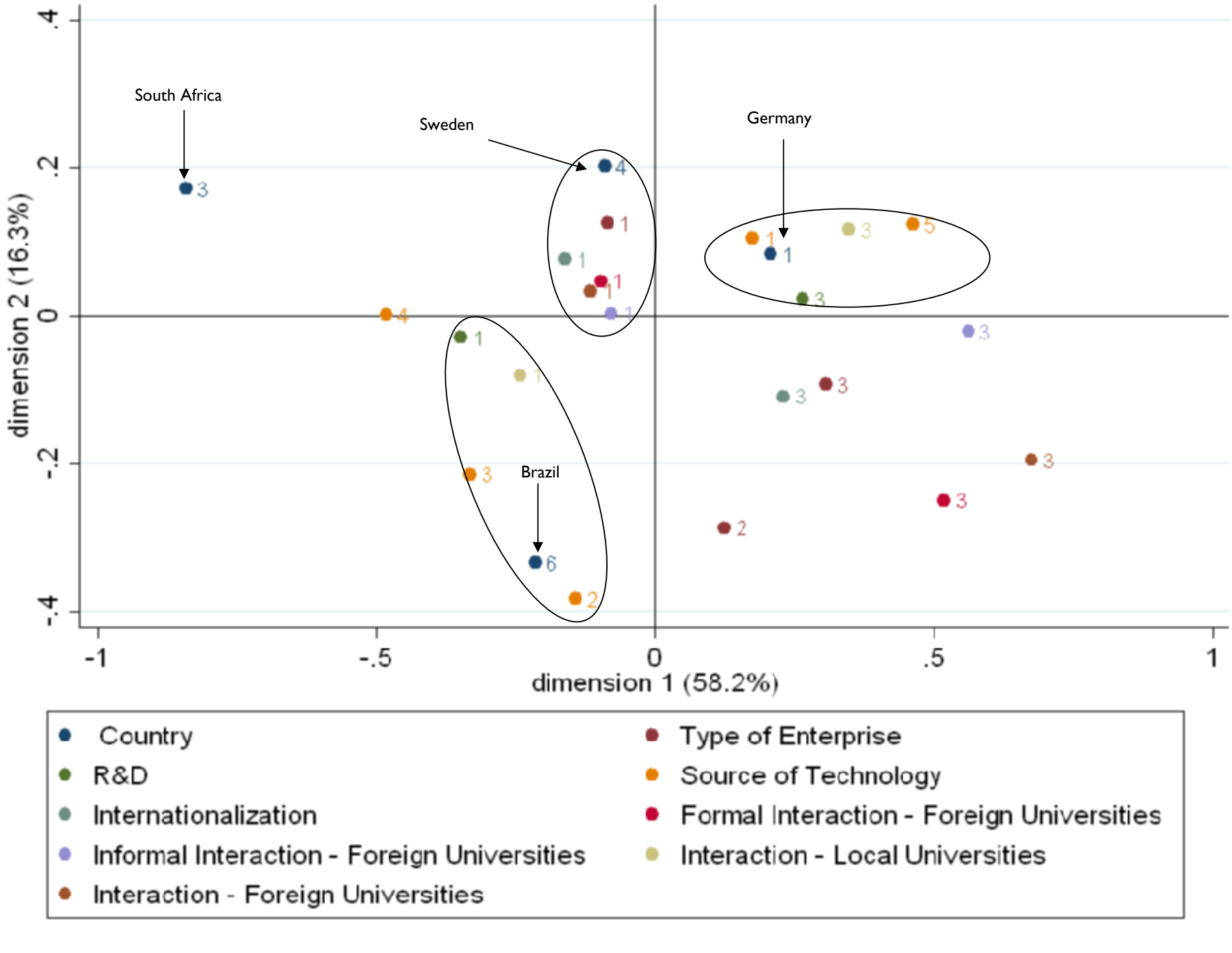
- If the points are displayed near to each other in the same quadrant we can define a specific profile.
- The disposition of categories in Chart 1 allows us to define four different profiles related to the countries analyzed.

- German Profile: all categories that indicate the existence of interactions between universities and companies are in this profile.
- South Africa: universities and research institutes as main sources of technology to the companies.
- Chinese profile: existence of significant R&D and some kind of internationalization of R&D or production processes. MNCs headquarters and subsidiaries are related to this profile

- Nordic profile: presence of standalone companies, absence of R&D and the purchase of knowledge from other companies - MNC's or not.
- Brazilian Profile: absence of formal or informal interactions with local or foreign universities.
- Estonia and Denmark are not related to a specific profile.

Sectorial Analysis: automotive

- Four countries were analyzed:
- Brazil – Sweden – Germany – South Africa


South Africa
Sweden
Germany
Brazil
dimension 2 (16.3%)
dimension 1 (58.2%)
.4
.2
0
-.2
-.4
-1
-.5
0
.5
1
Country
R&D
Internationalization
Informal Interaction - Foreign Universities
Interaction - Foreign Universities
Type of Enterprise
Source of Technology
Formal Interaction - Foreign Universities
Interaction - Local Universities

- German Profile: existence of significant R&D and interactions with universities and local research institutes, universities as the main source of knowledge as well as the company itself.
- Swedish Profile: autonomous companies; lack of internationalization of R&D activities and production; non-existence of interactions.
- Brazilian Profile: knowledge purchased from other branches of the MNC and non-MNCs, non-existence of R&D;.
- There is yet a profile that is not associated with any specific country, in which it is possible to identify the existence of formal and informal interactions with universities abroad and internationalization of R&D activities and production

Sectorial Analysis: agroprocessing

- Two countries were analyzed:
- South Africa – Denmark

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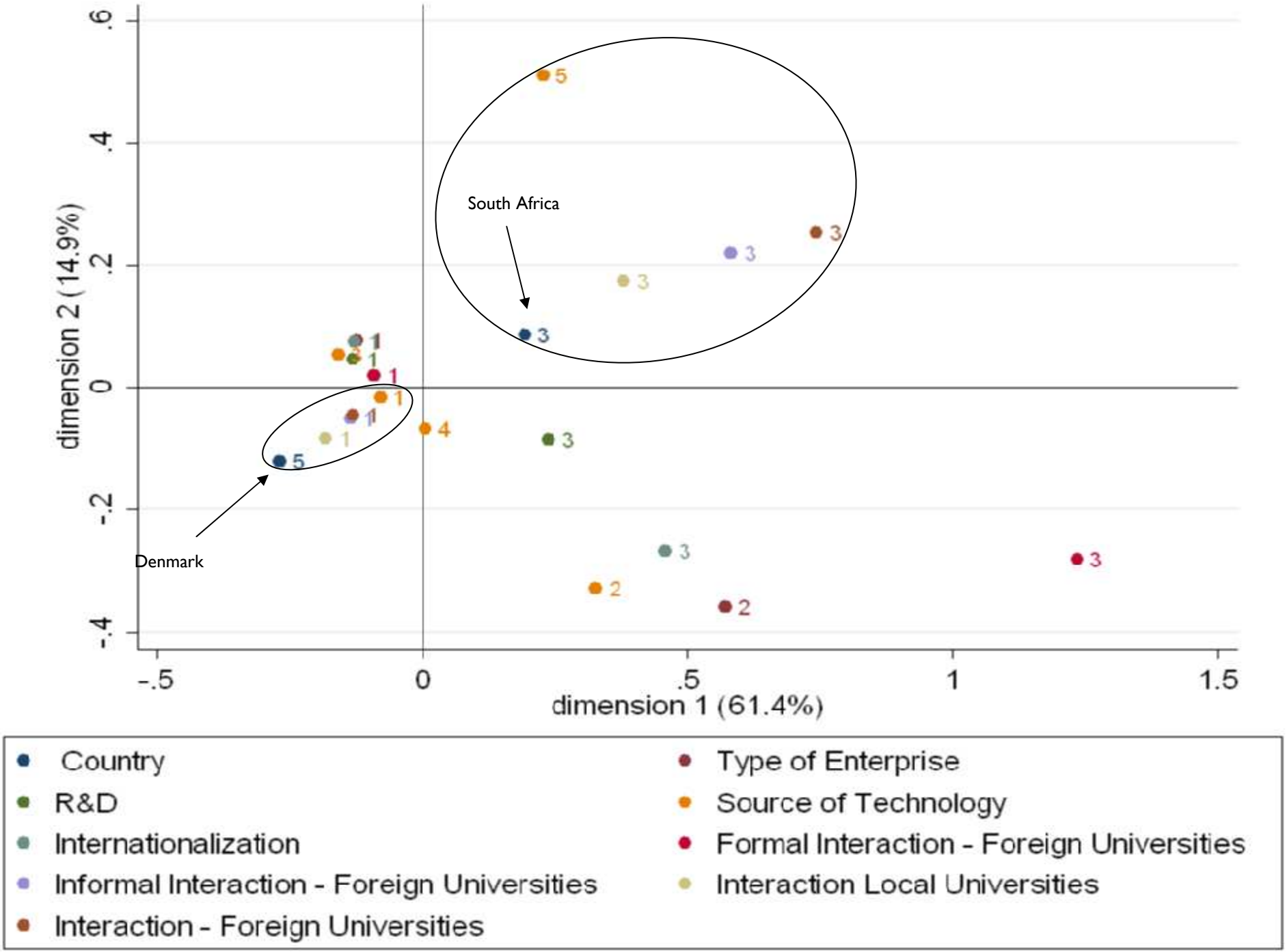
South Africa
Denmark
dimension 2 (14.9%)
dimension 1 (61.4%)
.6
.4
.2
0
-.2
-.4
-.5
0
.5
1
1.5
Country
R&D
Internationalization
Informal Interaction - Foreign Universities
Interaction - Foreign Universities
Type of Enterprise
Source of Technology
Formal Interaction - Foreign Universities
Interaction Local Universities

- South African Profile: existence of interactions between companies and local and foreign universities; universities and research institutes are indicated as main sources of technology to the companies.
- Danish Profile: Absence of interactions; the company is its own main source of technology.
- It is also possible to verify the existence of two other profiles that are not aligned to any of the two specific countries, but to the type of company. Standalone companies on the second quadrant and MNC's – subsidiary on the fourth.

Sectorial Analysis: ICT

- Four countries analyzed:
- China – Estonia – Norway – Sweden

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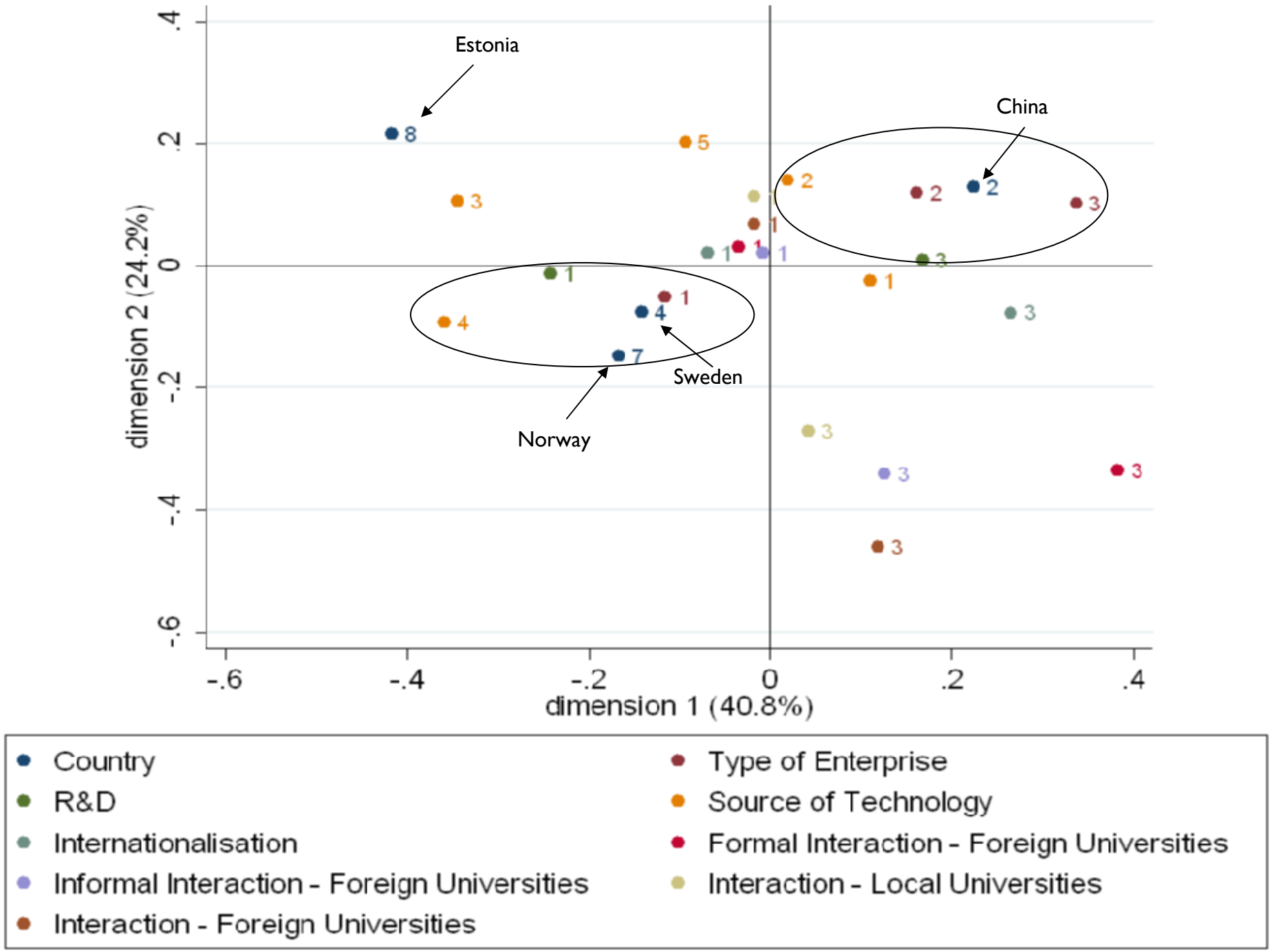
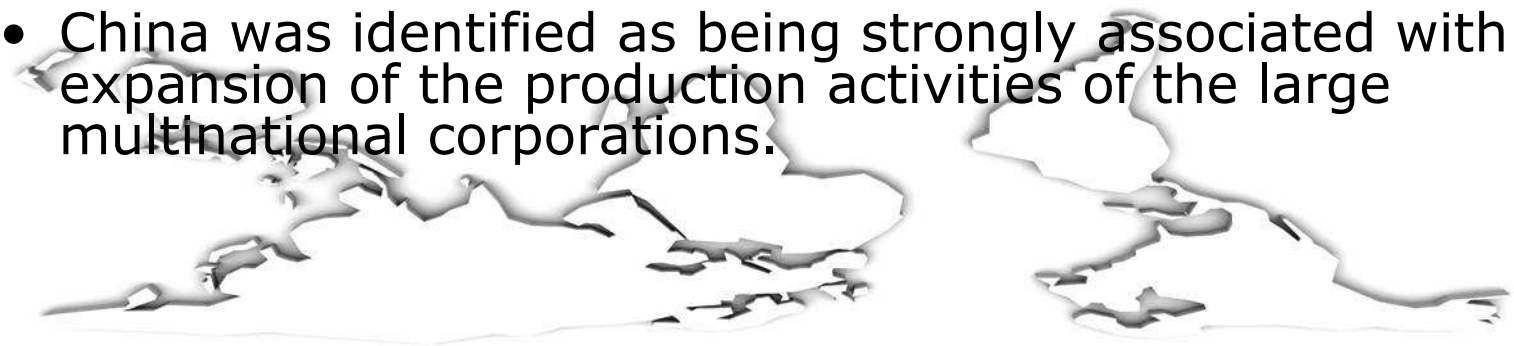

Estonia
China
Sweden
Norway
dimension 2 (24.2%)
dimension 1 (40.8%)
.4
.2
0
-.2
-.4
-.6
-.6
-.4
-.2
0
.2
.4
Country
R&D
Internationalisation
Informal Interaction - Foreign Universities
Interaction - Foreign Universities
Type of Enterprise
Source of Technology
Formal Interaction - Foreign Universities
Interaction - Local Universities

- Chinese Profile: associated with the existence of multinational companies -headquarters and subsidiaries- and the ones that do R&D; the acquisition of knowledge from other branches of the MNC.
- Nordic Profile: existence of autonomous companies; absence of R&D activities; tendency to purchase technologies from MNCs.
- Estonian Profile: search for technology in non-MNCs companies and in universities and other public institutes; absence of interactions between companies and universities

- Is possible to verify a fourth profile that is not associated with any of the assessed countries.
- Its characteristics are the presence of variables of interaction between universities and companies and the existence of processes of internationalization.

Conclusions

- Using the multiple correspondence analysis method it was shown that the observations of the sample can really be categorized in distinct profiles, each of them associated with a specific country or region.
- The behavior of the variables that were used allows the identification of specific characteristics for each one of the countries analyzed, which leads to the differentiation in profiles.
- The development of the NIS matters for our analysis about interaction (Germany x Brazil).
- While relationship between companies and universities are easily observed in a most a developed NSI, it is not so clear in the immature ones.
- China was identified as being strongly associated with the expansion of the production activities of the large multinational corporations.



Thanks! ¡Gracias! Obrigado!

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