

Measurement and differentiation of knowledge and information flows in Brazilian Local Productive Arrangements

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Paper to be presented to the 1st Globelics Conference
Innovation Systems and Development Strategies for the Third Millennium

Rio de Janeiro, 3 a 6 de novembro

Our acknowledgments

to Helena Lastres and José Cassiolato, Co-coordinator and Coordinator of the Research Network for local Productive and Innovative Systems, Institute of Economics, Federal University of Rio de Janeiro – RedeSist, IE/UFRJ for their ideas, contributions and remarks; and

to Edna Campello and Marcio Imamura, SINAL system development managers for detailed comments

Objectives

Discuss how to measure, analyze and differentiate knowledge and information (intangible) flows in Local Productive Arrangements

Understand the learning processes in LPAs, emphasising the connections between knowledge sources, information transmitted and incorporated innovations

Develop an exploratory empirical exercise based on quantitative data about six LPAs extracted from SINAL, a database developed by RedeSist

Analytical Framework

LPAs consolidation can be related to knowledge and information creation and circulation through collective learning processes based on complementary competencies and skills

Information and knowledge intangible flows play a very important role in innovative dynamics of Local Productive Arrangements

These flows might change according to characteristics of each sector and each geographical context

Information and knowledge interchange generates informal learning processes which must be distinguished from more formal learning mechanisms based on joint R&D efforts

There are a lot of possibilities to improve LPAs competitiveness due to learning informal mechanisms

Analytical Framework (cont.)

Informal learning processes refers to information circulation and to knowledge dissemination, which accelerate technological diffusion and organisational innovations

Informational flows improvement requires the consolidation of language codes and communication channels

LPAs informational density refers to the structured communication channels and to the variety and complexity of information transmitted

Some relevant aspects related to the complexity of information flows:

- variety of information sources
- diversity of knowledge bases
- tacit or codified knowledge (Senker, 1995)
- knowledge sources: know-what, know-why, know-how and know-who (Foray and Lundvall, 1996)

Impacts of Informational Flows

Intangible flows reinforce the connections and interdependencies between firms and institutions in LPAs, generating a social pool of knowledge

Informal information flows can promote an equalisation of capabilities and skills in LPAs

Information interchange has relevant impacts to the establishment of technical standards, normalisation procedures and quality control techniques

LPAs can promote a process of knowledge codification which allow a systematic interchange of information

Methodological Foundations: LPAs and SINAL Database

Definition of LPAs (RedeSist): a productive agglomeration of economic, social and politic agents with focus in specific sets of economic activities with interdependent bonds, even incipient

Empirical evaluation of LPAs information and knowledge flows is a complex task, implying the adoption of specific conceptual and methodological procedures.

The project of SINAL (Local Productive Arrangements and Innovative Systems Information System) intends to create an analytical instrument to support understanding of LPAs configuration and local dynamics.

Research Network for Local Productive and Innovative Systems - RedeSist

- **an interdisciplinary research net, legalized since 1997, hosted in the Institute of Economics of Federal University of Rio de Janeiro, Brazil.**
- **comprises other universities and research institutes in some Brazilian states, and partnerships in Latin America, Europe and Asia institutions**
- **interest subjects: related to industrial and technological development new requirements associated to Knowledge Age, as well as public policies in this new context**
- **main research focus: arrangements and local productive systems; particular attention is given to developing regions and countries**

Methodological Foundations: LPAs and SINAL Database

SINAL includes data from RedeSist's surveys and from secondary sources, offering statistics, indicators and thematic maps that speed spatial analysis and data analysis associated to LPAs configuration.

SINAL is based on an interdisciplinary and multi-thematic approach, conceiving innovation and development phenomena as characterised by spatial simultaneity of different processes - cultural, political, social and economic, beside others.

SINAL aims to transform RedeSist researchers' practices and tacit knowledge into codified and stabilised methodologies for systematic evaluations of LPAs interactions amplitude and intensity - real or potential - between agents and institutions.

Sinal: great enrolled subjects

Cities

General Characterization

Enterprise Structure

Employment, Wages and
Remuneration

Production

Foreign trade

Investments

Knowledge Infrastructure

Cooperation

Interaction and governance

Public and Private Policies

Performance Indicators

Arrangements

population's life conditions

knowledge's infrastructure

new institutionalities

public and private services
(externalities)

employment and economic
activities

(especially in farming,
agribusiness, commerce and
other services, besides
manufacturing industries).

The specific focus on informational flows

Systematisation of data related to information interchange and cooperation forms revealed in RedeSist's surveys (a exploratory codification and aggregation of interviewed firms answers are available to system's users)

In order to discuss the characteristics of knowledge and information flows in LPAs two groups of questions are considered:

1) information sources used by firms to promote technological innovations: (i) universities and technological centres; or (ii) suppliers, customers or other companies in the sector

2) relative importance of innovation incorporation sources: (i) from direct cooperation with different agents or (ii) from machinery and equipment acquisition.

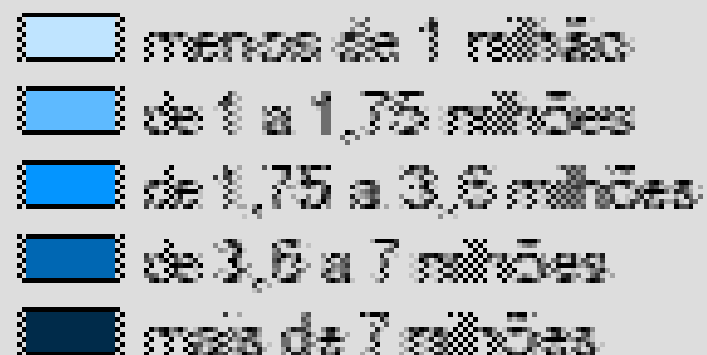
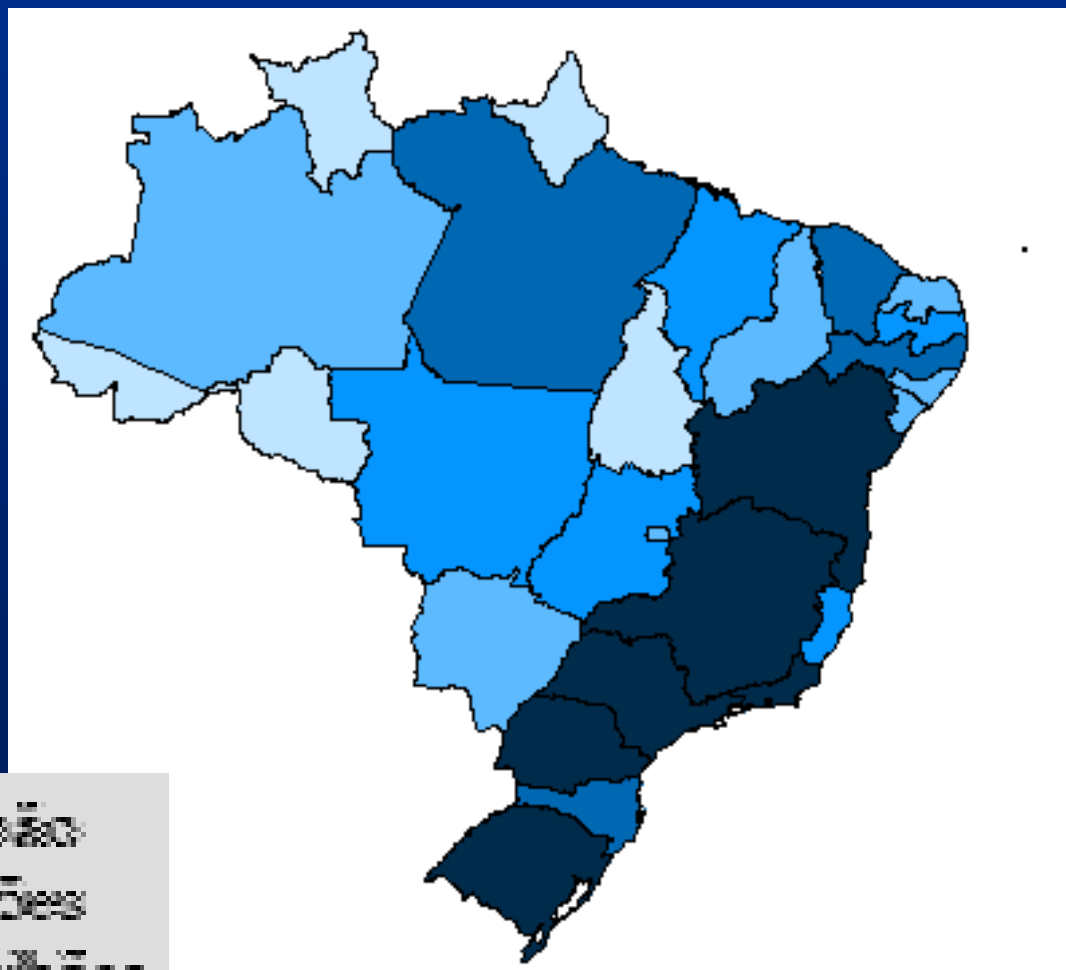
The focus on a cross-sector analysis

Analysis is mainly based on data from 'very innovative' firms LPAs in each sector : firms with one or more 'very important' product or process innovation in the 90's

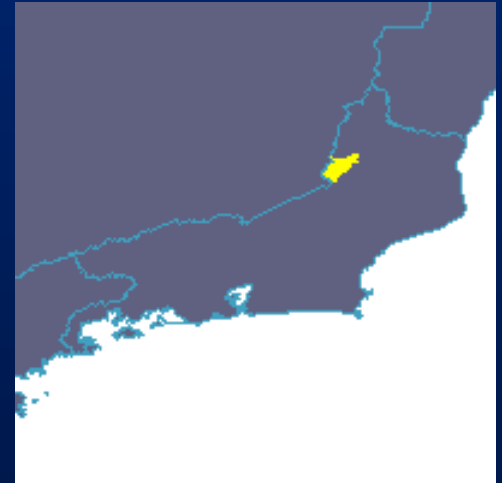
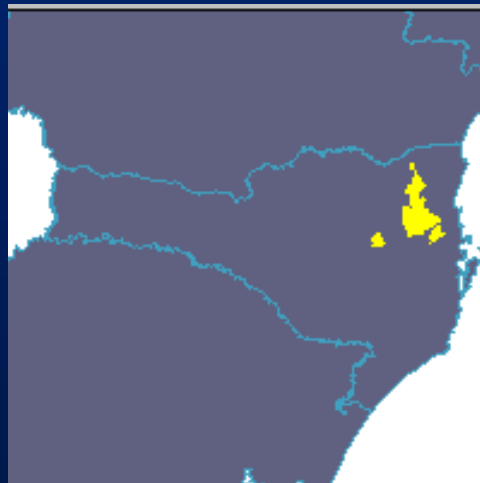
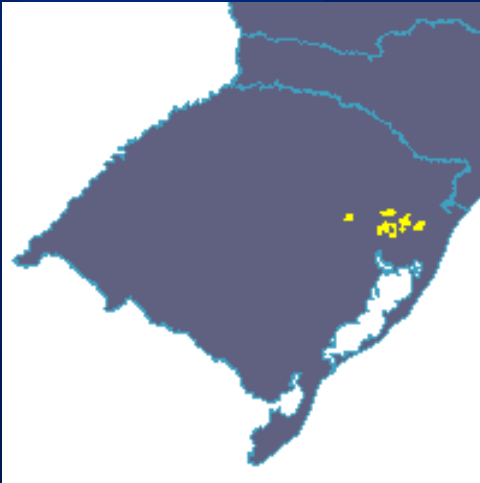
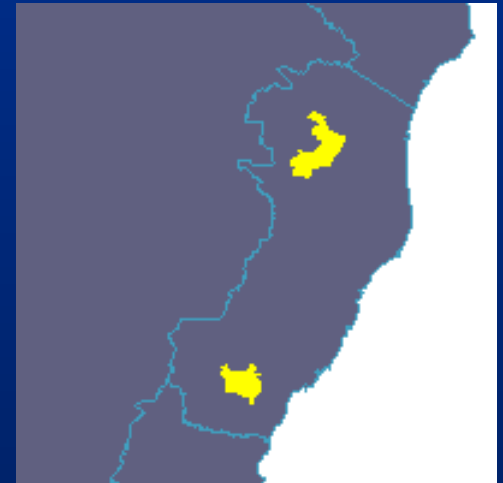
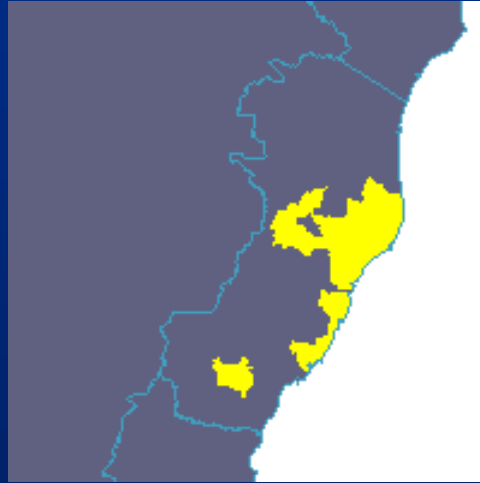
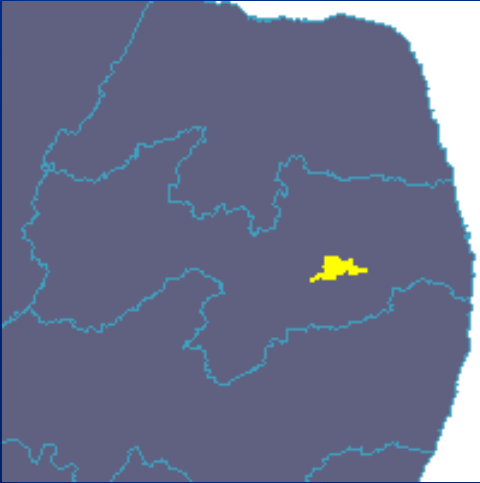
Analysis comprises six LPAs:

- 1) metal-mechanics sector - Espírito Santo, ES
- 2) footwear - Campina Grande, Paraíba, PB
- 3) footwear - Vale dos Sinos, Rio Grande do Sul, RS
- 4) ornamental stones – Rio de Janeiro, RJ
- 5) ornamental stones - Espírito Santo, ES
- 6) textile and clothing - Vale do Itajaí, Santa Catarina, SC

População residente alfabetizada de 10 anos ou mais de idade – Brasil IBGE, Censo 2000 in www.sinal.ie.ufrj.br



Selected Arrangements



First Approach

all firms in selected arrangement

Analyses dimension:

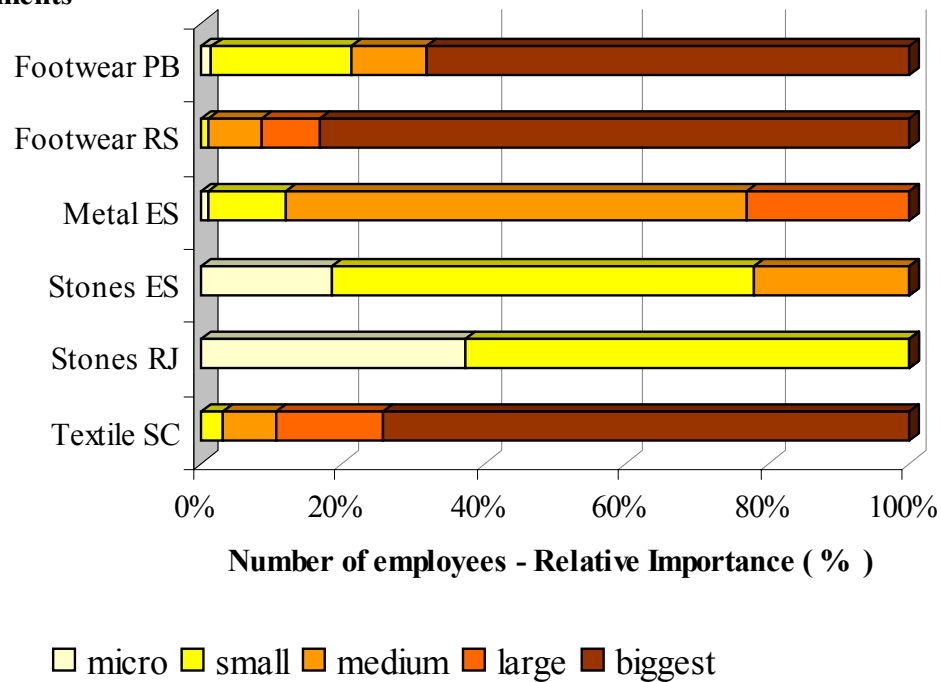
- employment structure
- enterprise structure
- patterns of product and process innovation

Employment Structure by Firm's Size in selected LPAs – 1999

Graphic 1

Employment Characteristics by Firm's Size in selected LPAs - 1999

Arrangements

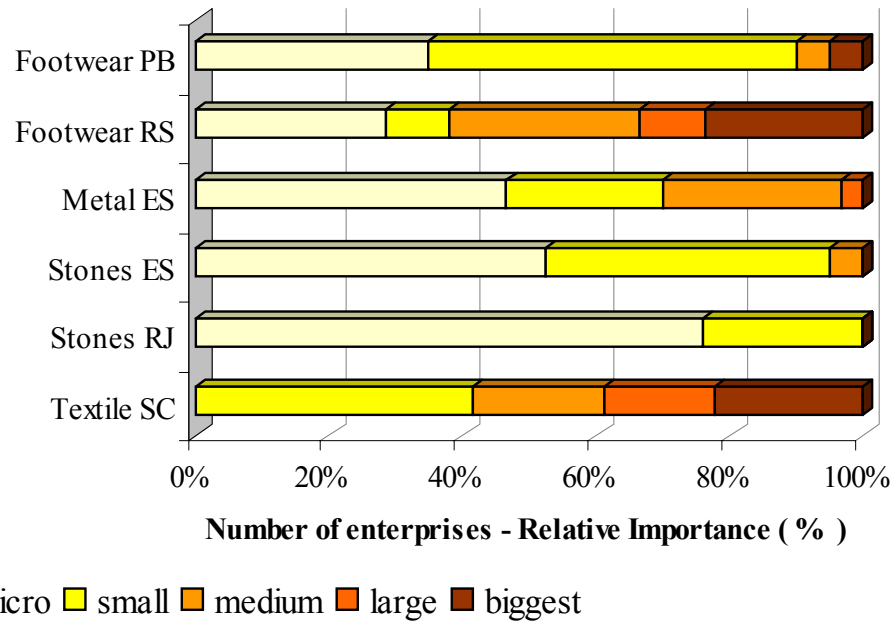


Enterprise Structure by Firm's Size in selected LPAs – 1999

Graphic 2

Enterprise Structure Characteristics by Firm's Size in selected LPAs - 1999

Arrangements



Patterns of product and process innovation

All firms	Footwear PB	Footwear RS	Metal ES	Stones ES	Stones RJ	Textile SC
All Innovations	100 %	100%	100%	100%	100%	100%
Product Innovation	33%	33%	36%	25%	36%	33%
Process Innovation	67%	67%	64%	75%	64%	67%
Very innovative firms/ total firms (%)						
Firms	50	71	87	48	48	97
Employees	77	30	91	67	66	99

Second Approach

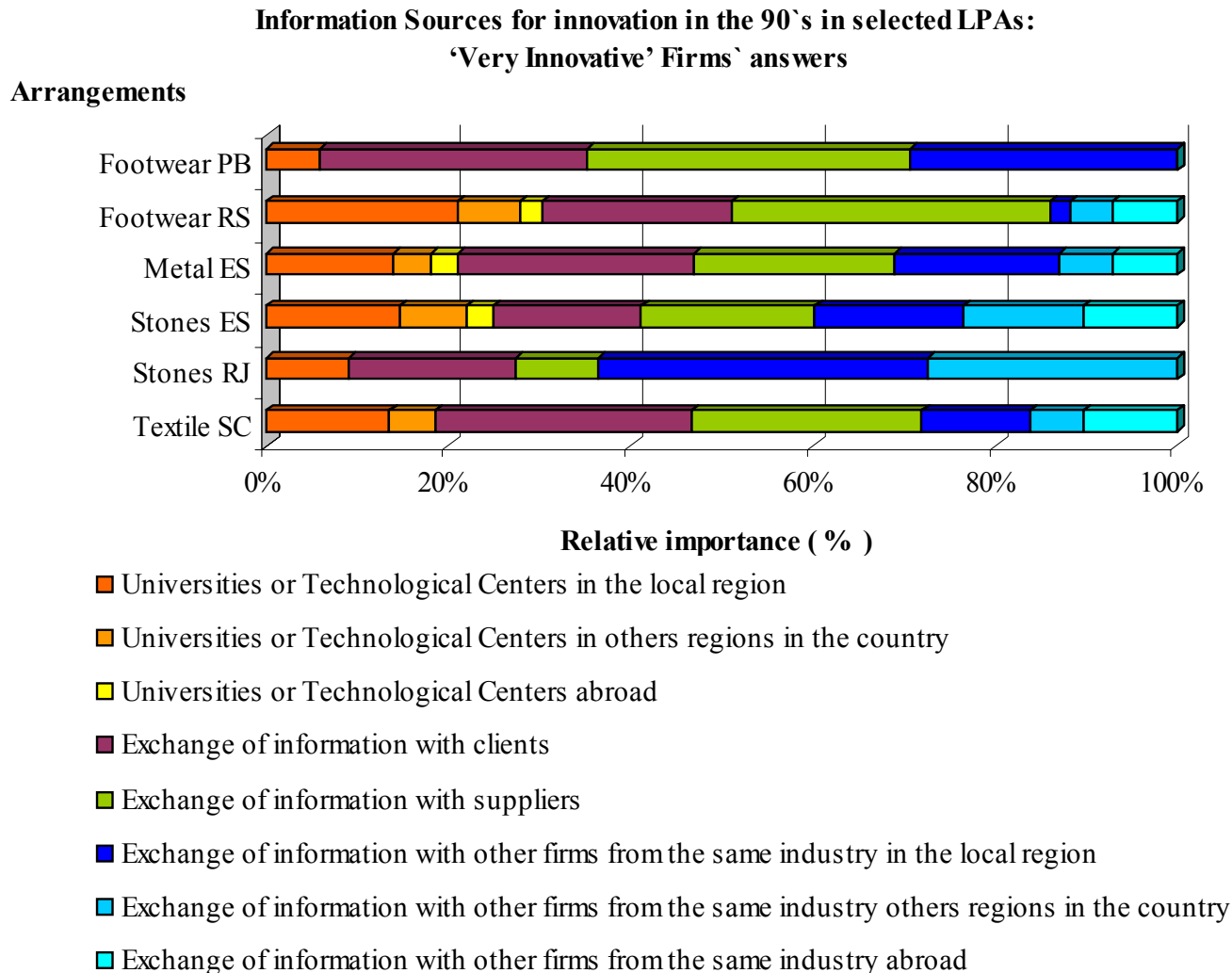
very innovative firms in arrangement

Analyses dimension:

- employment structure
- enterprise structure
- patterns of product and process innovation
- sources of information to product and process innovation
- sources for technology development or incorporation

Sources of Information for innovation in the 90's in selected LPAs: 'Very Innovative' Firms' answers

Graphic 3



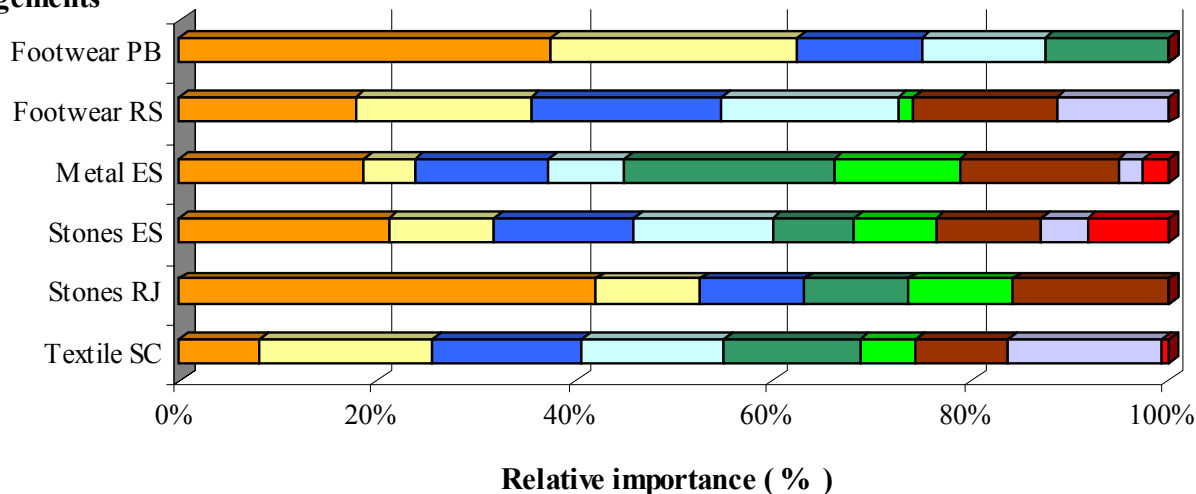
Sources of Product or Process Innovation Introduction in the 90's in selected LPAs: 'Very Innovative' Firms'

Graphic 4

answers

Sources of Product or Process Innovation Introduction in the 90's in selected LPAs: 'Very Innovative' Firms' answers

Arrangements



- Acquisition of machinery and equipment at the national market
- Acquisition of machinery and equipment abroad
- Cooperation with suppliers of equipment
- Cooperation with suppliers of raw materials
- Cooperation with clients
- Cooperation with competitors
- Cooperation with other institutions (Universities, business associations, etc.)
- Intramural research (R&D Laboratories)
- Exchange of personnel with the main office of the group

Exploratory results: very innovative firms

Correspondence between the more relevant **sources of information** and **innovation incorporation** :

Significative:

1- information - **suppliers X equipment acquisition** in national market (exception Textile/SC) and international market (exception Metal/ES)

2- information- **suppliers X cooperation - equip./ material supplier** (exception, Ornamental Stones/RJ)

3- information -**clients X cooperation - clients** in Footwear/PB, Textile/ SC, Metal/ES.

4- information – **universities & TCs X cooperation – institutions** in Metal/ES, Footwear/RS, Ornamental Stones/ES

Exploratory results: very innovative firms

Correspondence between the more relevant **sources of information** and **innovation incorporation** :

No Significant:

- 1- information – **competitors X cooperation competitors**
(exception Metal/ES)
- 2- less importance of R&D efforts to innovation incorporation,
unless in Textile (SC) and Footwear (RS)

Conclusions

Exploratory perspective of the analysis

Limitations of methods and instruments used to collect data, related to the original questionnaire used in empirical studies.

Despite the fact that original questionnaire was not tailored for our specific focus, data transferred to SINAL have proved to be very rich, stressing differences between arrangements informal learning mechanisms.

Efforts to refine and improve the questionnaire seem particularly useful to construct indicators and analytical tools well adapted to measure knowledge and informational flows complexity in LPAs.

Some steps to move ahead...

- identify aspects related to knowledge and informational flows that might be incorporated in LPAs systematic analysis.
- development of further studies based on LPAs comparative analysis.
- cross-time analysis to understand the trajectory of those flows.
- confront LPAs knowledge base evolution with changes in governance structures, as well as with specific incentives from government policies.
- develop a geographical analysis to evaluate how local institutions - related to scientific-technological infrastructure
- could help to improve LPAs knowledge base