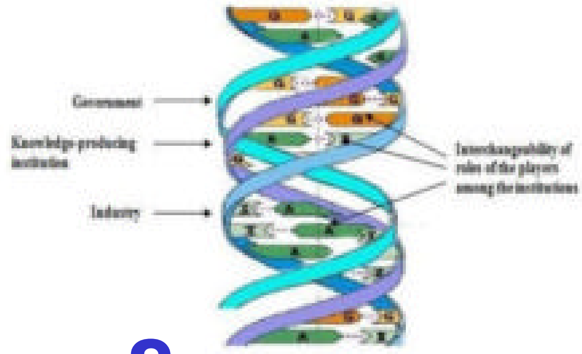


Market Driven Clusters & Global Value Chains:

The Bio-Medical Technology Cluster in the UK

Dr. Emanuela Todeva

Director of Research Centre for Business Clusters, Networks and Economic Development

University of Surrey

bcned

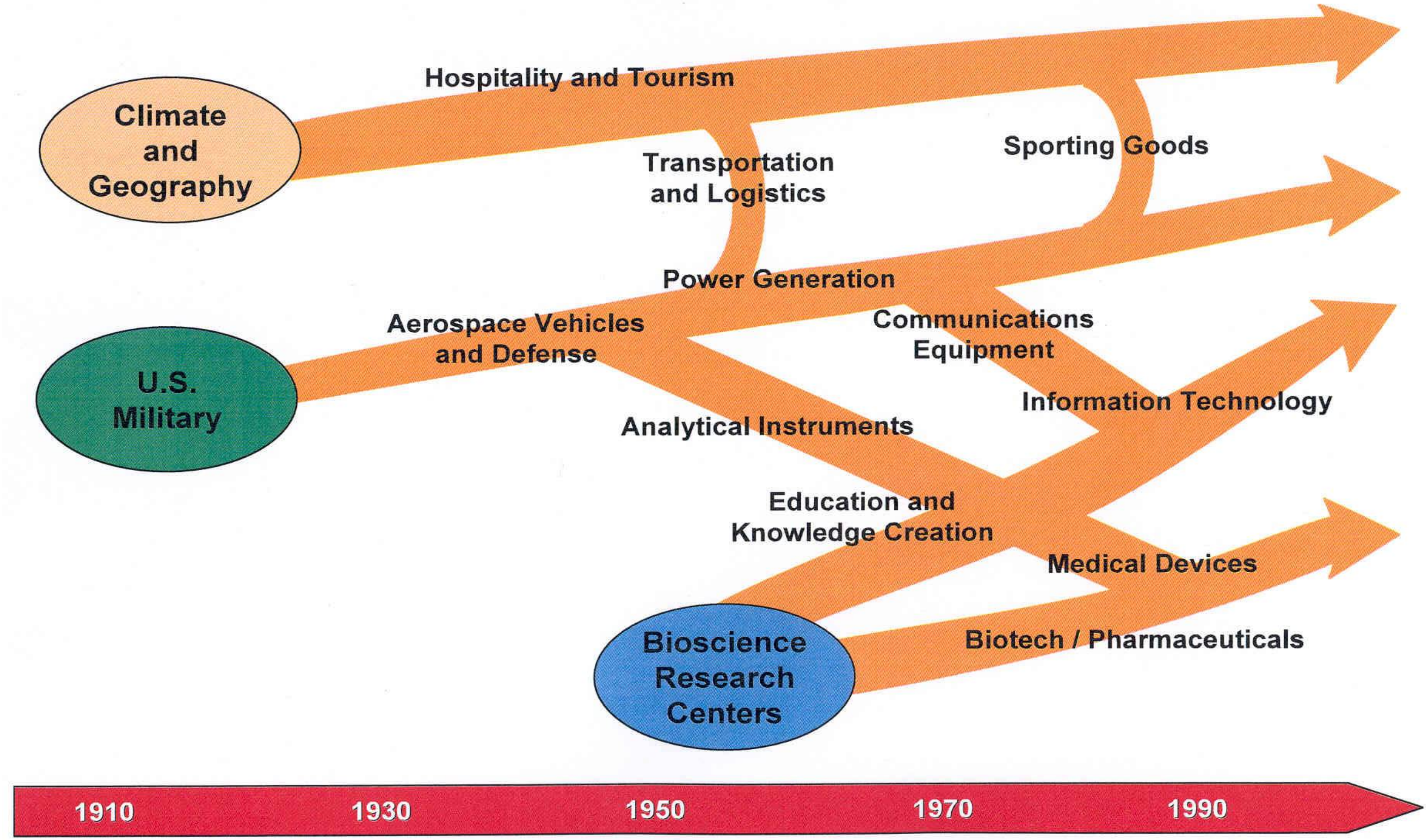
Definition of Clusters

Clusters are agglomerations of firms & institutions, co-located in a geographic area, connected by *value-adding activities,* and with access to benefits from *input/output markets, infrastructure and environmental coordination* via policies (E. Todeva, 2006).

http://www.surrey.ac.uk/BCNED/

http://papers.ssrn.com/sol3/cf_dev/AbsByAuth.cfm?per_id=1124332

San Diego Bio-tech (Porter, 2002)



The Evolution of the Biopharma Sector in Ireland, and its Projected Future Development

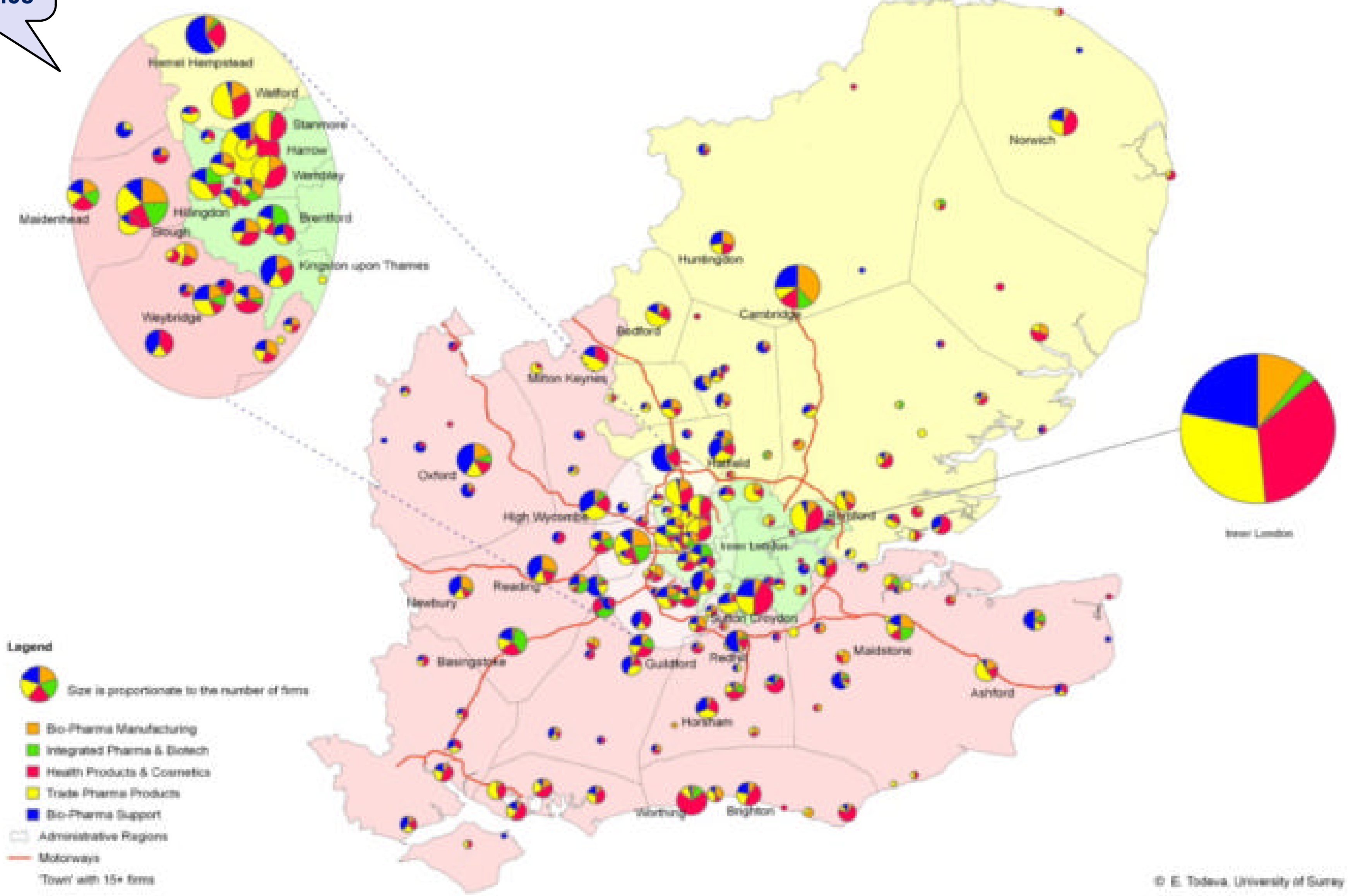
Strategy in Action, Pharmachemcial Ireland

1960s -1980s	1980s- 1990s	2000s	2015s
Single platform technologies APIs manufacturing Q&A labs	Manufacturing of Liquids Tableting Patches Creams Molecular diagnostics	Biopharma Regional HQ status Shared services- supply chain, regulatory, finance operation excellence process and product development Manufacture for clinical trails Pharma contract services	Value added generic pharmaceuticals Convergent medical technologies Personal medicines Combination medical products

Bio-Medical & Health, Greater South East, 2008

Location Boundaries

Database Firms
'Locational Concentration Across Regional Boundaries'
Greater South East, UK



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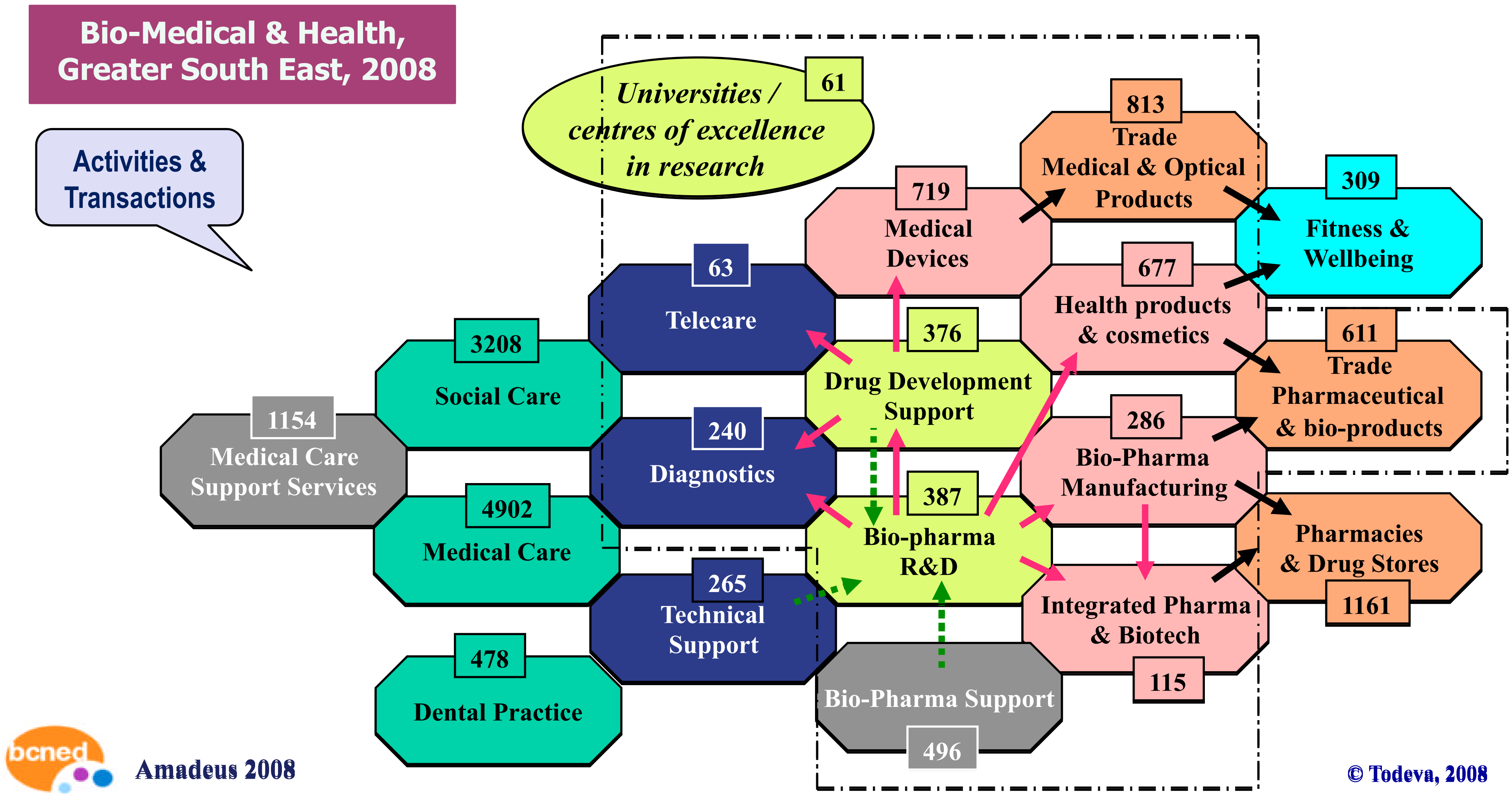
- The Use of <u>complementary databases</u> comprising of the entire population of firms and funded research projects
- Developed a <u>Multi-Stage Cluster Methodology</u> for Cluster mapping and analysis
- <u>Investigating Brokerage, Intermediation, & Information sharing</u> across firm / regional / country boundaries

Database Firms
'Concentration of firms in the Value Chain in the Region'
Greater South East, UK

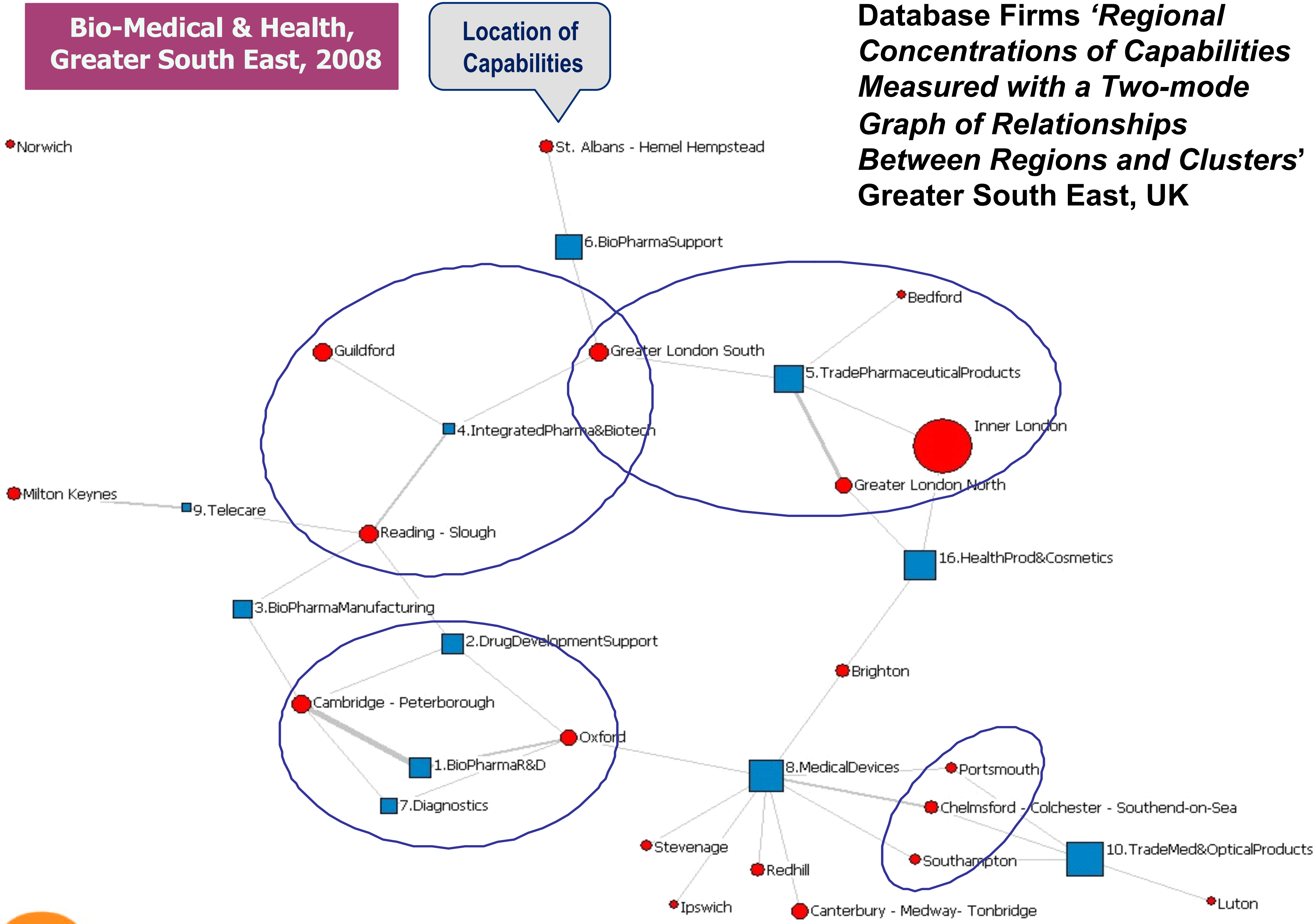


Examples

Bio-Pharma R&D	Research and development resulting in a pharmaceutical or biotechnology product
Drug Development Support	Research supplies, contract research, platform technology, medical-related research, nano-biotech, clinical trials, supportive research foundations, other related engineering R&D
Bio-Pharma Manufacturing	Companies with primary activity being the manufacture of biopharmaceutical products
Integrated Pharma and Biotech	Pharmaceutical R&D Companies which also manufacture and market medicines developed in house
Trade Pharmaceutical Products	Companies providing pharmaceutical products, including wholesalers, retailers and marketers
Bio-Pharma Support Services	Consulting, market research, finance, patents and regulatory for health technology sector, incubators, recruitment, leasing ie. NO products on sale
Diagnostics	Diagnostic kits, equipment, reagents, imaging technologies, development, manufacturing, marketing
Medical Devices	Development, manufacture, sales of medical devices including laboratory equipment, optical and drug delivery devices
Telecare	Companies engaged in assistive technology
Trade Medical and Optical Products	Companies selling medical and optical products and equipment, including wholesalers and retailers
Technical Support and Equipment	Installation, maintenance of medical equipment, software solutions, specialised IT, sale of equipment, data management

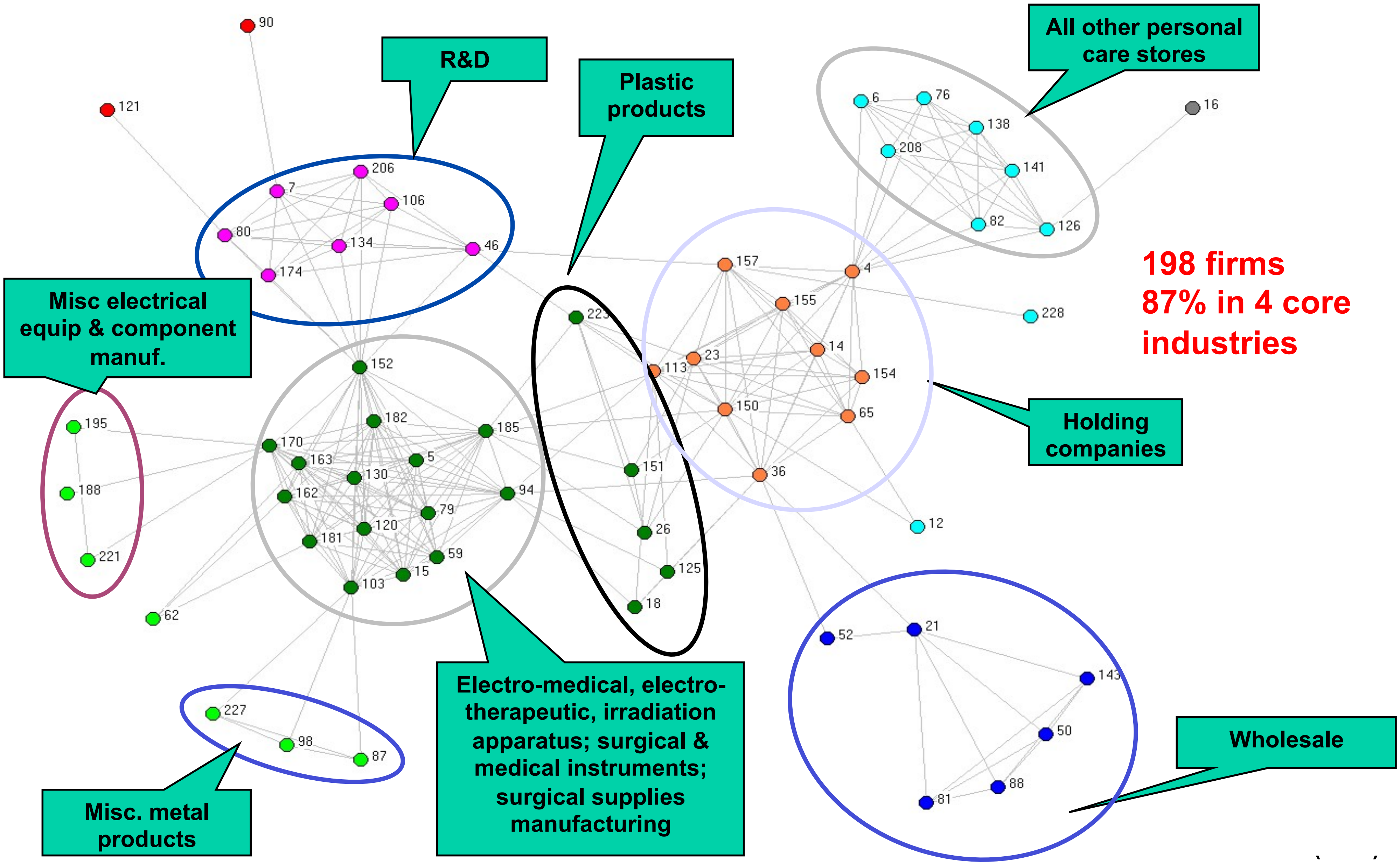
Bio-Medical & Health, Greater South East, 2008

Database Firms *'Regional Concentrations of Capabilities Measured with a Two-mode Graph of Relationships Between Regions and Clusters'* Greater South East, UK

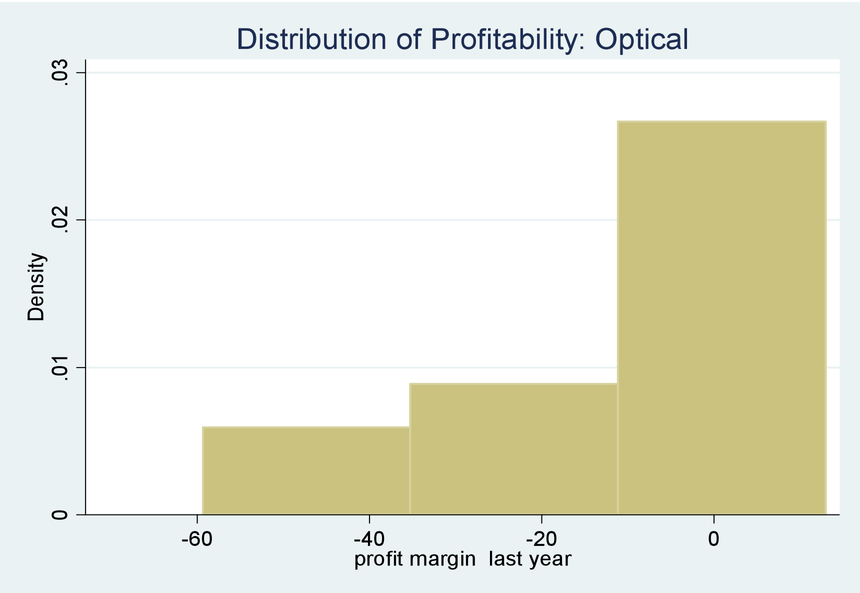


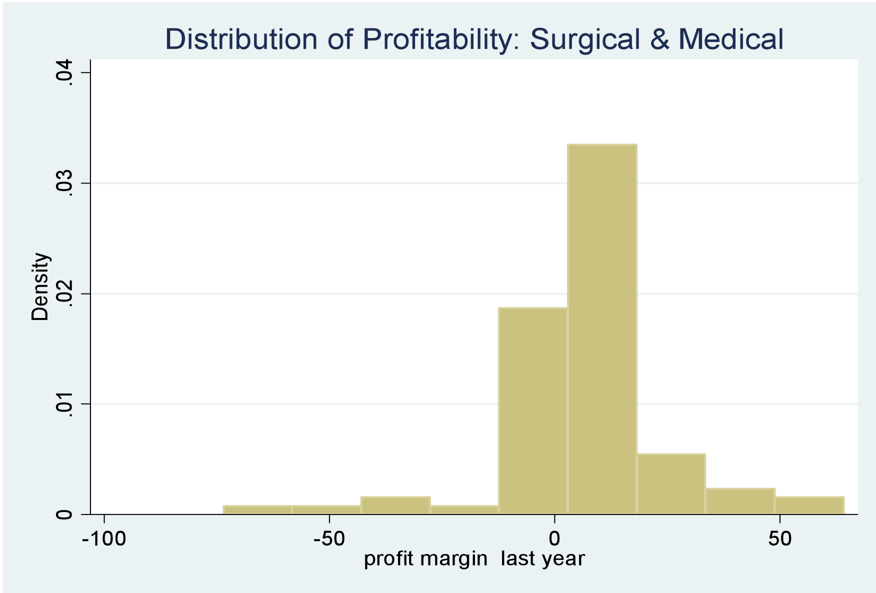
Cluster Value Chain: SURGICAL & MEDICAL INSTRUMENTS MANUFACTURING
(198 firms, ties between firms based on 5 or more shared industry codes)

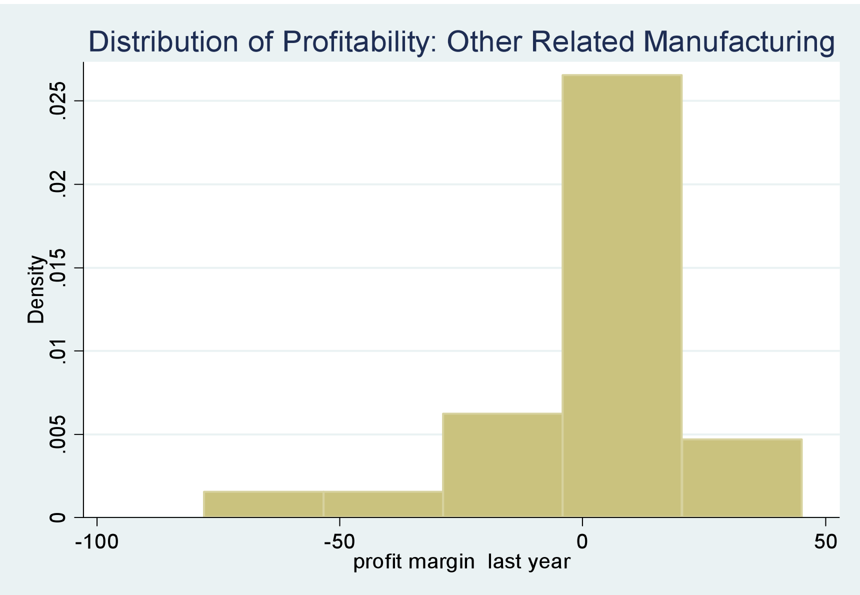
(87% of firms have the core industry codes: 334510 Electro-medical and Electrotherapeutic Apparatus Manufacturing; 334517 Irradiation Apparatus Manufacturing; 39112 Surgical and Medical Instrument Manufacturing; 339113 Surgical Appliance and Supplies Manufacturing)



Comparative Performance Across the Three Manufacturing Sectors

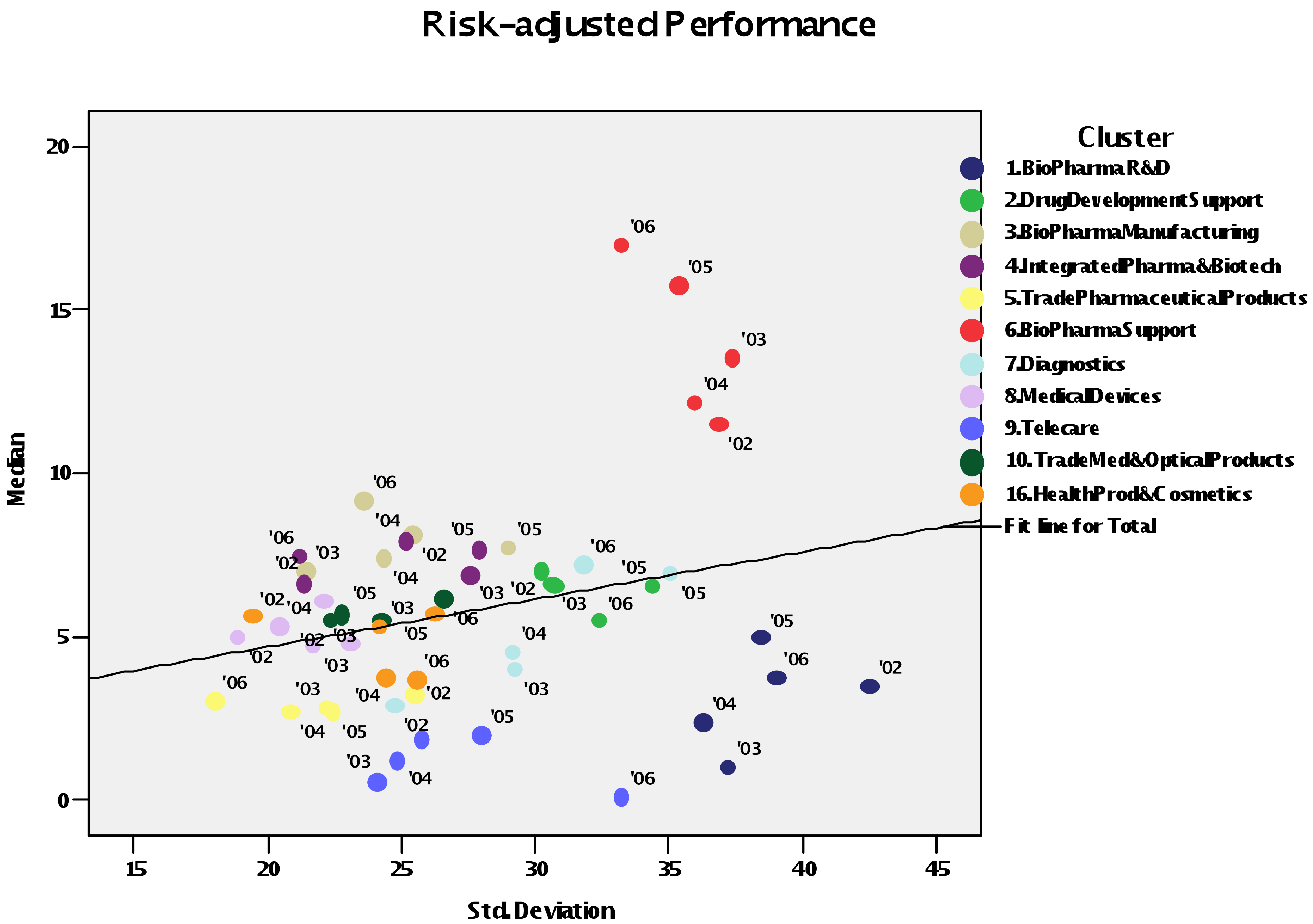






With this comparative inter-cluster analysis, we can conclude that the 'surgical and medical' cluster has generated greater profitability over the last three years, and that the trend has moved towards sustained out-performance by this cluster group. The 'optical' cluster exhibits the greatest deterioration in relative performance over time, while the 'other related manufacturing' cluster shows a consistent underperformance throughout the last three years.

Median Profitability Over the Last 3 Years			
	Profit Margin (t)	Profit Margin(t-1)	Profit Margin(t-2)
Optical	0.01805	0.0673	0.0495
Surgical/Medical	0.07235	0.0591	0.0367
Other Related Manufacturing	-0.00265	0.0213	0.00515



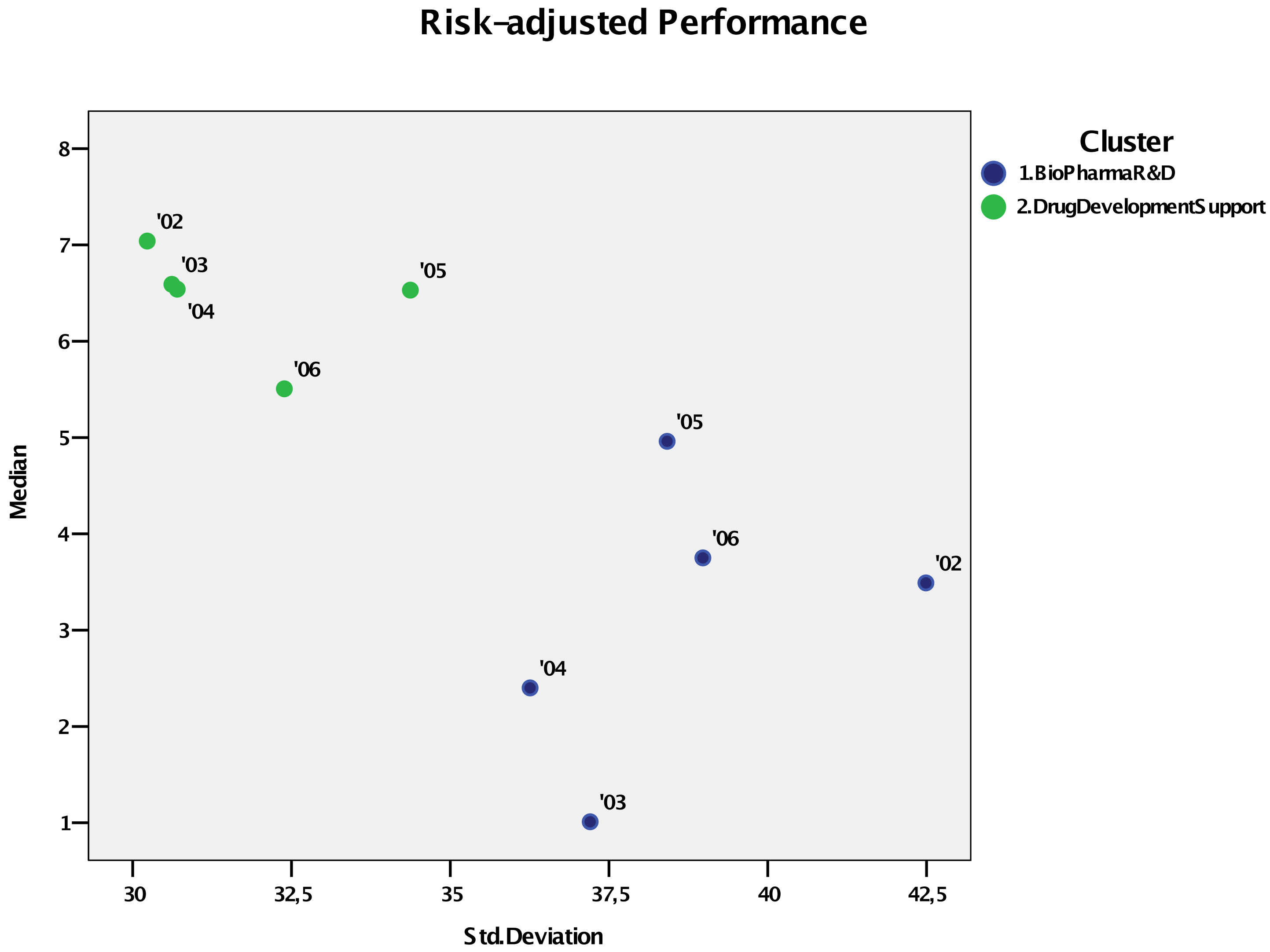
Risk-adjusted Performance
Median
Std. Deviation
Cluster
1.BioPharma R&D
2.Drug Development Support
3.BioPharma Manufacturing
4.Integrated Pharma & Biotech
5.Trade Pharmaceutical Products
6.BioPharma Support
7.Diagnostics
8.Medical Devices
9.Telecare
10.Trade Med & Optical Products
16.Health Prod & Cosmetics
Fit line for Total

© Todeva, 2008

Bio-Medical & Health, Greater South East, 2008

Database Firms
'*Comparative Longitudinal Performance Analysis*'
Greater South East, UK

Costs / Value Extraction



Best Performers in Surgical & Medical Instruments Manufacturing

\	Region	Number of Years	Trade description	Peer Group Description	Operating revenue turnover th GBP	Employ ees	Profit loss before tax th GBP	Cash-flow th GBP	Total assets th GBP
COOPERVISION MANUFACTURING LIMITED	Southampton	4	Engaged in contact lens contract manufacture.	Manufacture of medical and surgical equipment and orthopaedic appliances	51620	1704	2077	4656	65498
Huntleigh Healthcare Limited	Luton	10	Development, manufacture and distribution and rental of electromedical equipment.	Manufacture of medical and surgical equipment and orthopaedic appliances	124369	1296	22337	24211	108812
ABBOTT DIABETES CARE LIMITED	Oxford	6	Manufacture and sale of blood glucose testing equipment.	Manufacture of medical and surgical equipment and orthopaedic appliances	75727	1225	7656	13530	105214
CDK U.K. LIMITED	Portsmouth	10	Manufacture import and distribution of hospital products including hosiery dressings & intravenous	Manufacture of medical and surgical equipment and orthopaedic appliances	178522	1087	11189	21233	188065
B-D U.K. HOLDINGS LIMITED	Oxford	10	Holding company, group are involved in manufacture and marketing of medical, surgical and laboratory products, and the provision of research material to the life science industry.	Manufacture of medical and surgical equipment and orthopaedic appliances	169154	1050	13496	16156	84385
BECTON, DICKINSON U.K. LIMITED	Oxford	10	Wholesale, manufacturing	Manufacture of medical and surgical equipment and orthopaedic appliances	154224	952	11793	13535	74256

***Source*: BVD, Amadeus, 2005**

Sources of Strategic Advantage

National Innovation Systems & Policies

University Research

Science Parks

R&D Support

SME Support

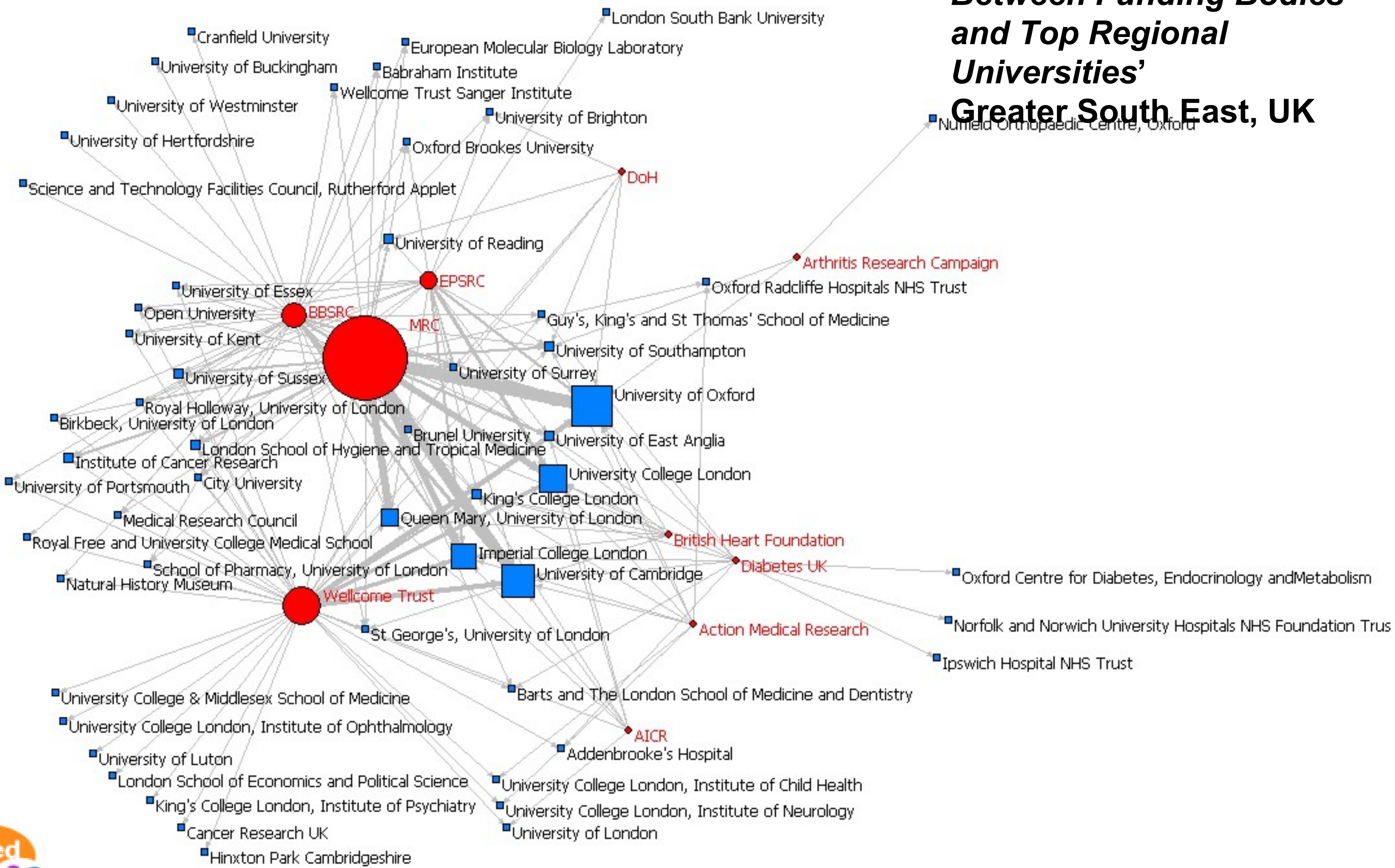
Knowledge Networks & Partnerships Support

Innovation, Intermediation & Finance

Bio-Medical & Health, Greater South East, 2008

Resource Allocation

Database Research Projects
'Funding Relationships Between Funding Bodies and Top Regional Universities'
Greater South East, UK



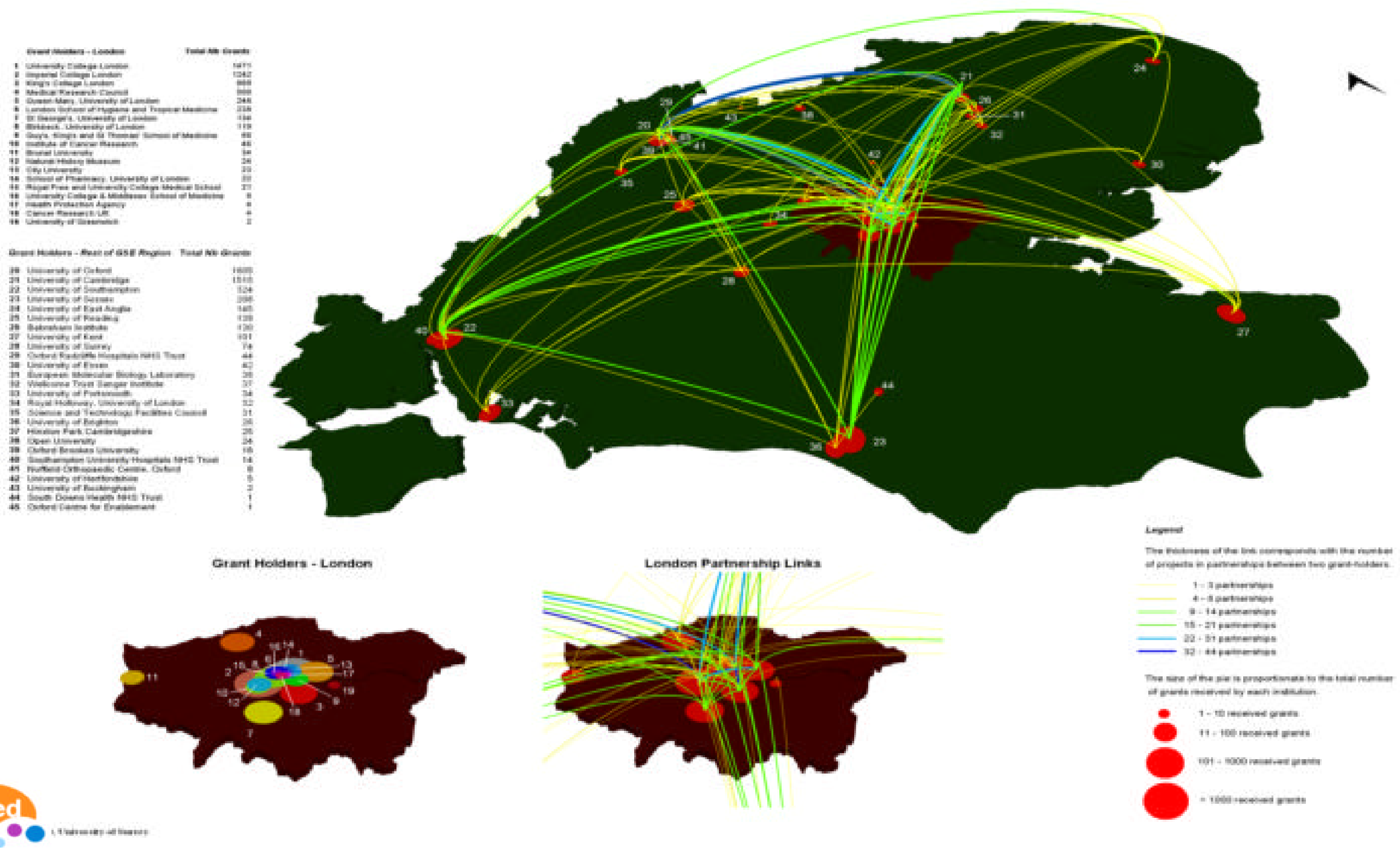
Bio-Medical & Health, Greater South East, 2008

Regional Inter-University Alliances & Partnerships

Database Research Projects
'*Regional University Collaborations*'
Greater South East, UK

Map of Regional Research Collaborations in Health Technology and Life Sciences

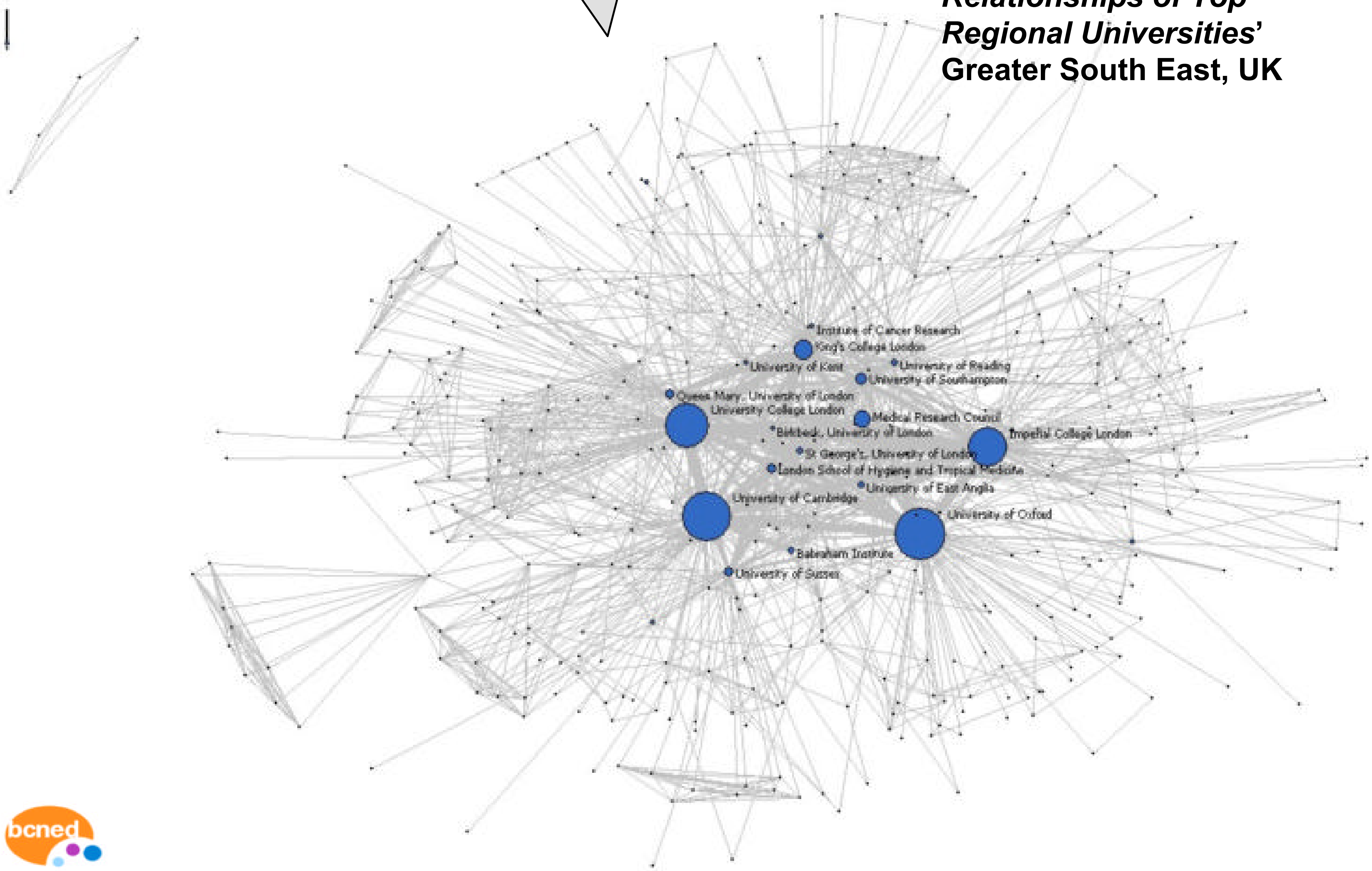
Greater South East, UK



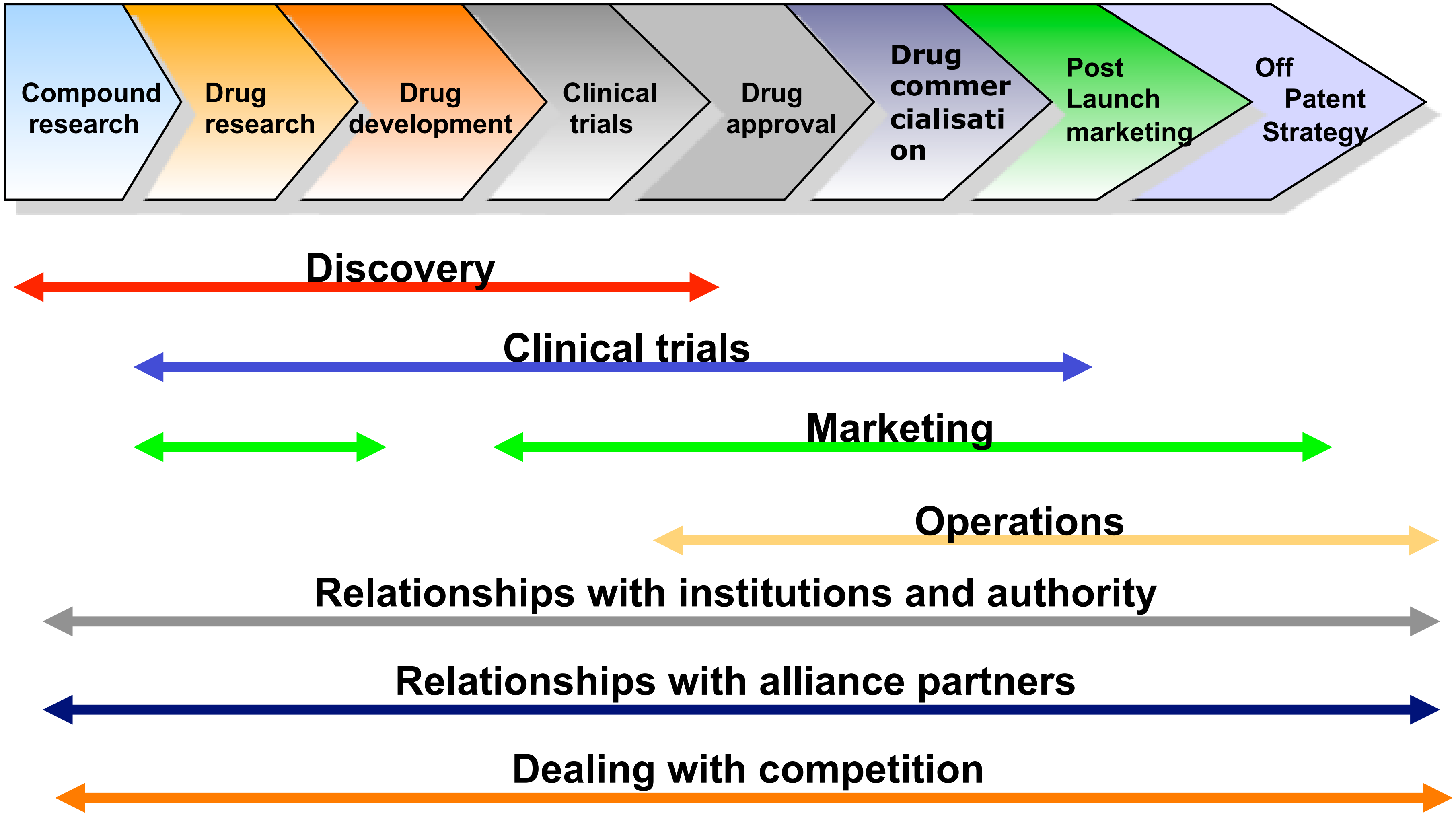
Bio-Medical & Health, Greater South East, 2008

Global University Alliances & Partnerships

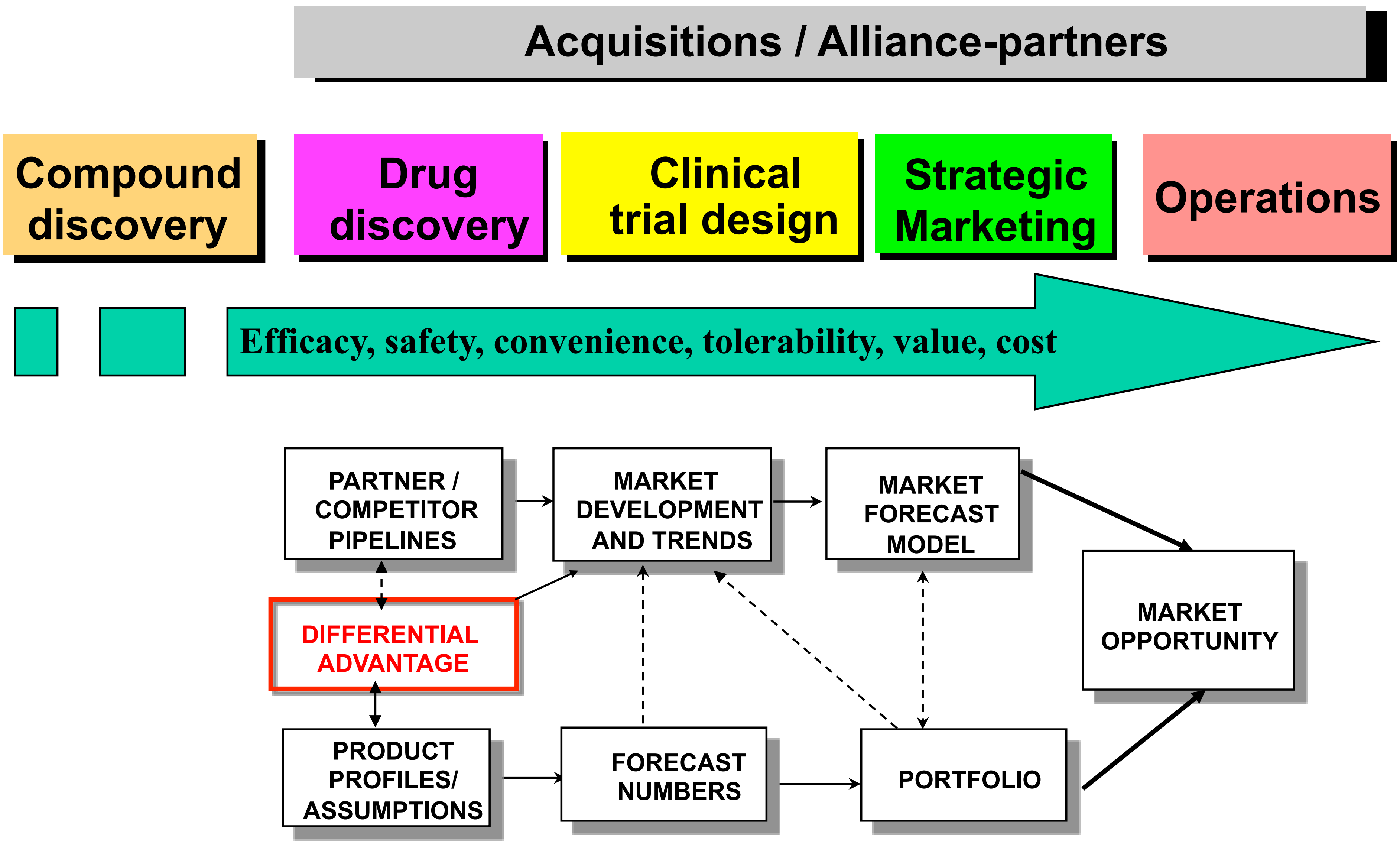
Database Research Projects
'*Global Collaborative Relationships of Top Regional Universities*'
Greater South East, UK



Managing the Pharma-product Cycle



Value Chain and Value Added Network



Value Chain, Value Added and Global Value Chains

(www.globalvaluechains.org)

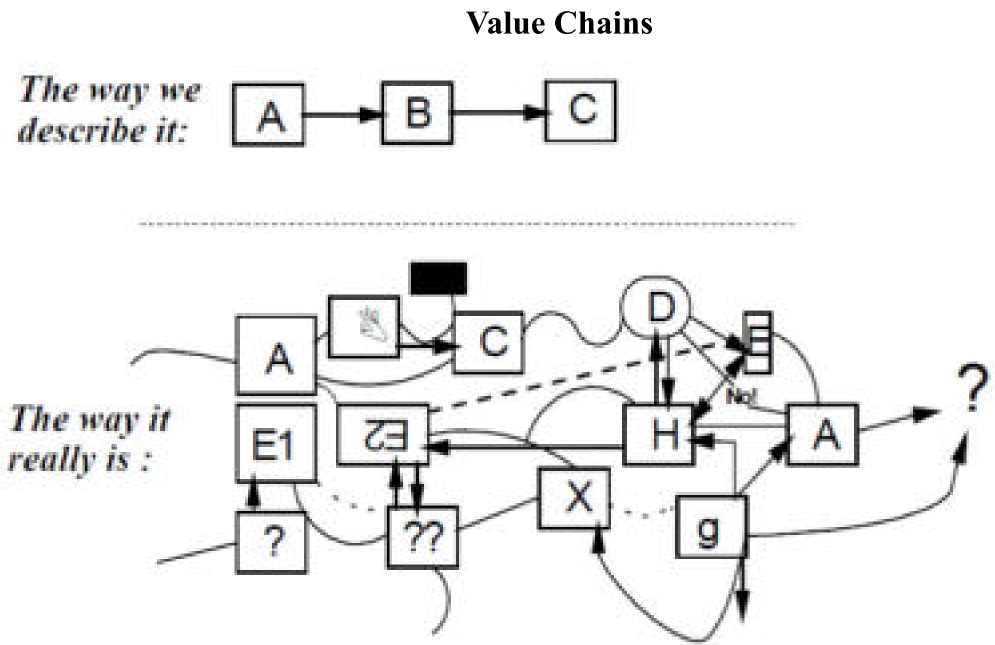
- The value chain describes the full range of activities that firms and workers do to bring a product from its conception to its end use and beyond. This includes activities such as design, production, marketing, distribution and support to the final consumer.
- Higher volumes of intermediate products such as parts, components and intermediate services are being produced in stages or processes across different countries and then exported to other countries for further production.
- Today almost 60% of trade in goods is in intermediates and the average import content of exports is around 40% (Lamy, 2013)
- Given the increasing complexity and sophistication in GVCs, it has been difficult to identify who produces what kind of value for whom by what kind of activity in the chain.

GVC – Interconnected Input-Output Markets for

- resources (*supply networks & trade of intermediate products*)
- skills (*outsourcing networks*)
- capital (*shareholder networks*)
- production technology (*R&D alliances*)

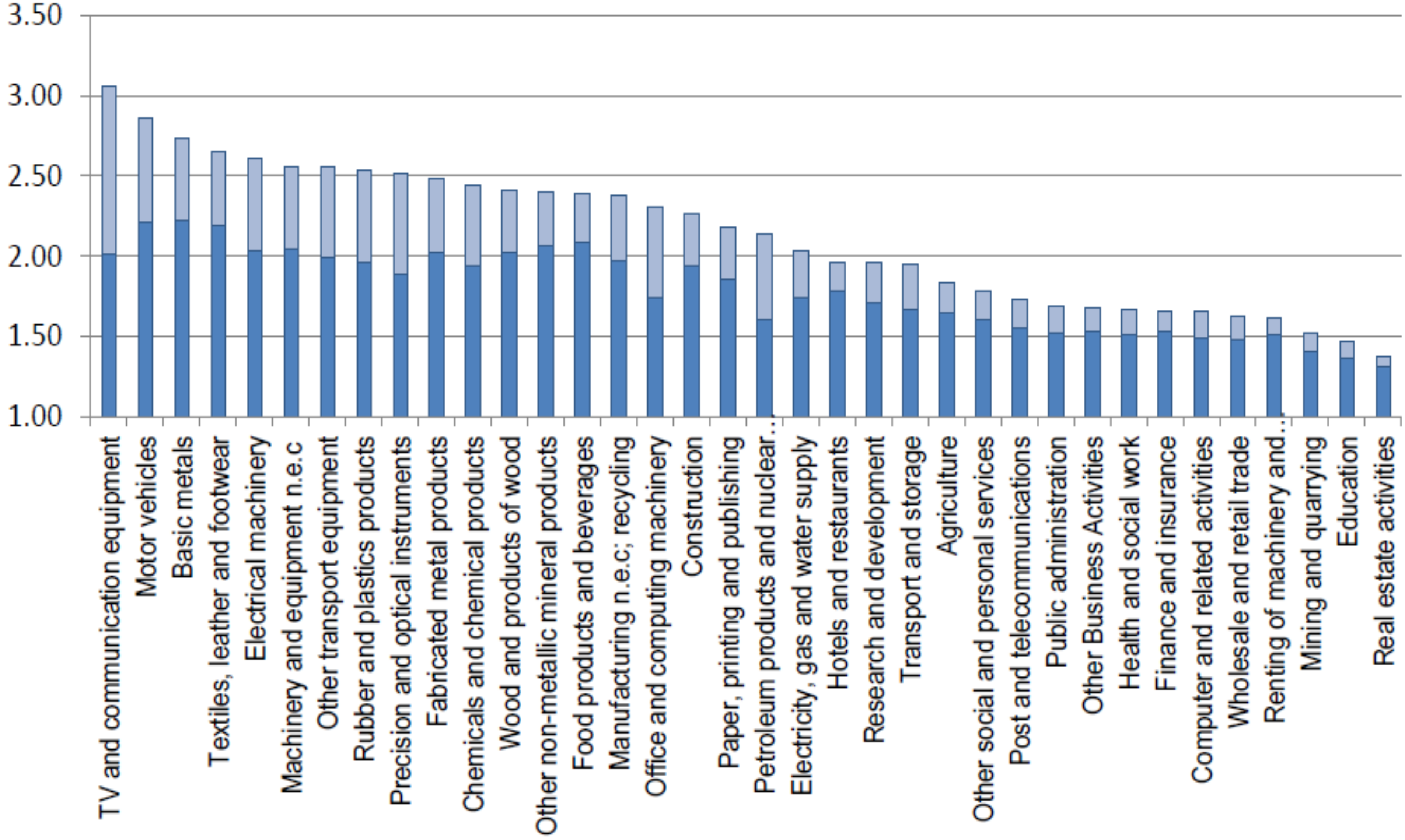
GVC – Organisation & Coordination

of production and value added activities across borders and firm boundaries



GVC – Interconnected Organised Production Capabilities and Country Resources

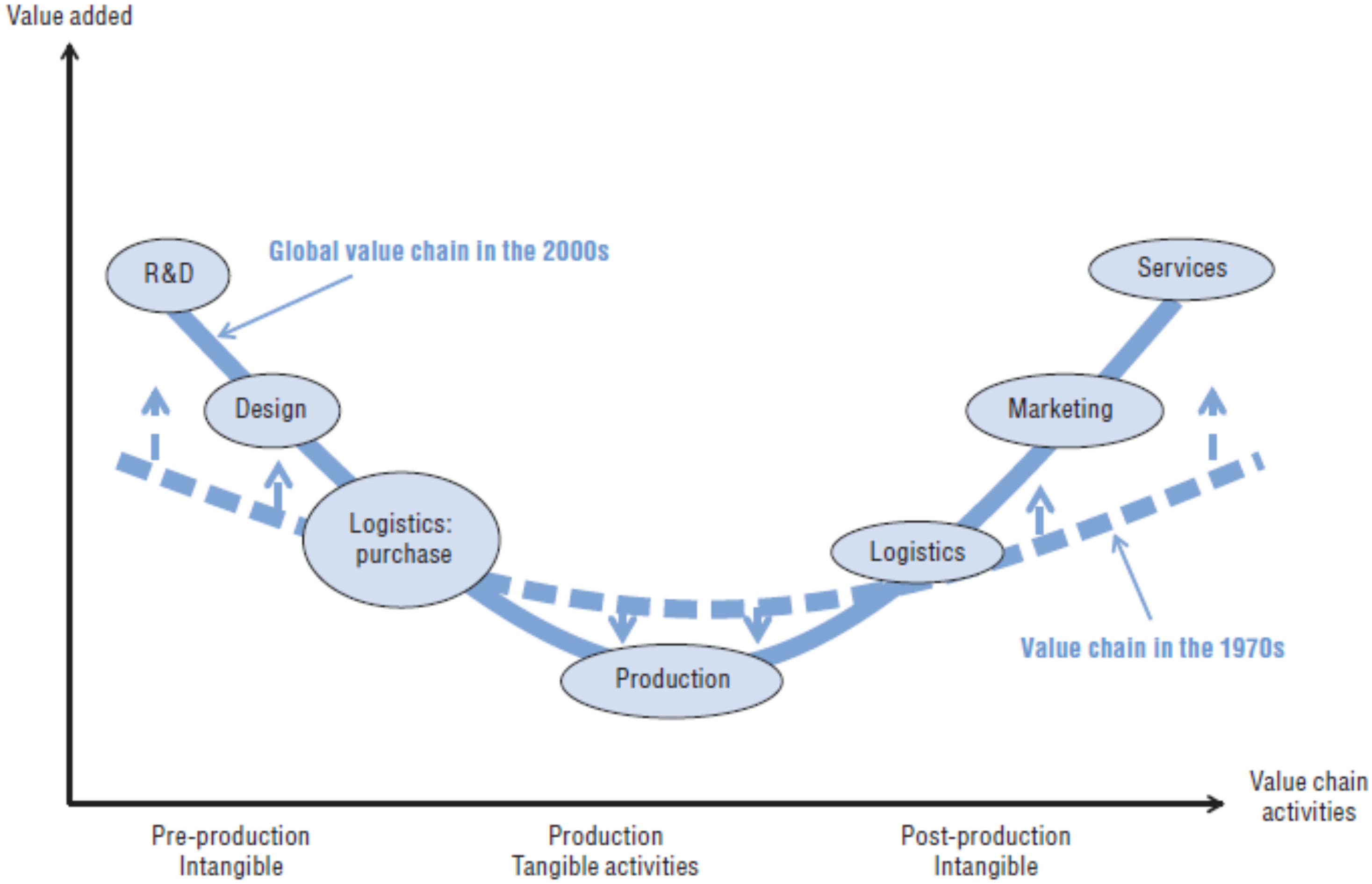
Louis Brennan , 2014



Source: Authors' calculations based on the OECD ICIO model, May 2013 release. The minimum value of the index is 1 when no intermediate inputs are used to produce a final good or service.

Value Added Along the GVC

(OECD, 2013)



Source: Based on Shih (1992), Dedrick and Kraemer (1999), and Baldwin (2012).

Moving Up the Value Chain

- (1) Upgrading
  - Process upgrading
  - Product upgrading
  - Functional upgrading
  - Chain or inter-sectoral upgrading
- (2) Task bundling
- (3) Workforce development and innovation
- (4) Ensuring cost competitiveness
- (5) Improving the connectivity with international markets
- (6) Improving business and investment climates
- (7) Fostering innovation and building capacity

Conclusions – Supporting Cluster Development & Its Integration into Global Value Chains Through Intermediation & Facilitation

- prioritising and balancing between competition and cooperation
- bridging to enhance information transparency of suppliers and contracts
- creating effective institutions and intermediation practices
- New policy framework that provides incentives for networking & decision support
- Contract management support (platform governance & legal representation / protection)
- Strategic alliance management
- Market access management

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Potential Industrial Clusters in Brazil

Cluster	LQ	LISA
PCR - Potential Cluster Regions	L>2	High
SR - Specialised Regions	L>2	-----
PR - Periphery Regions	L<2	High

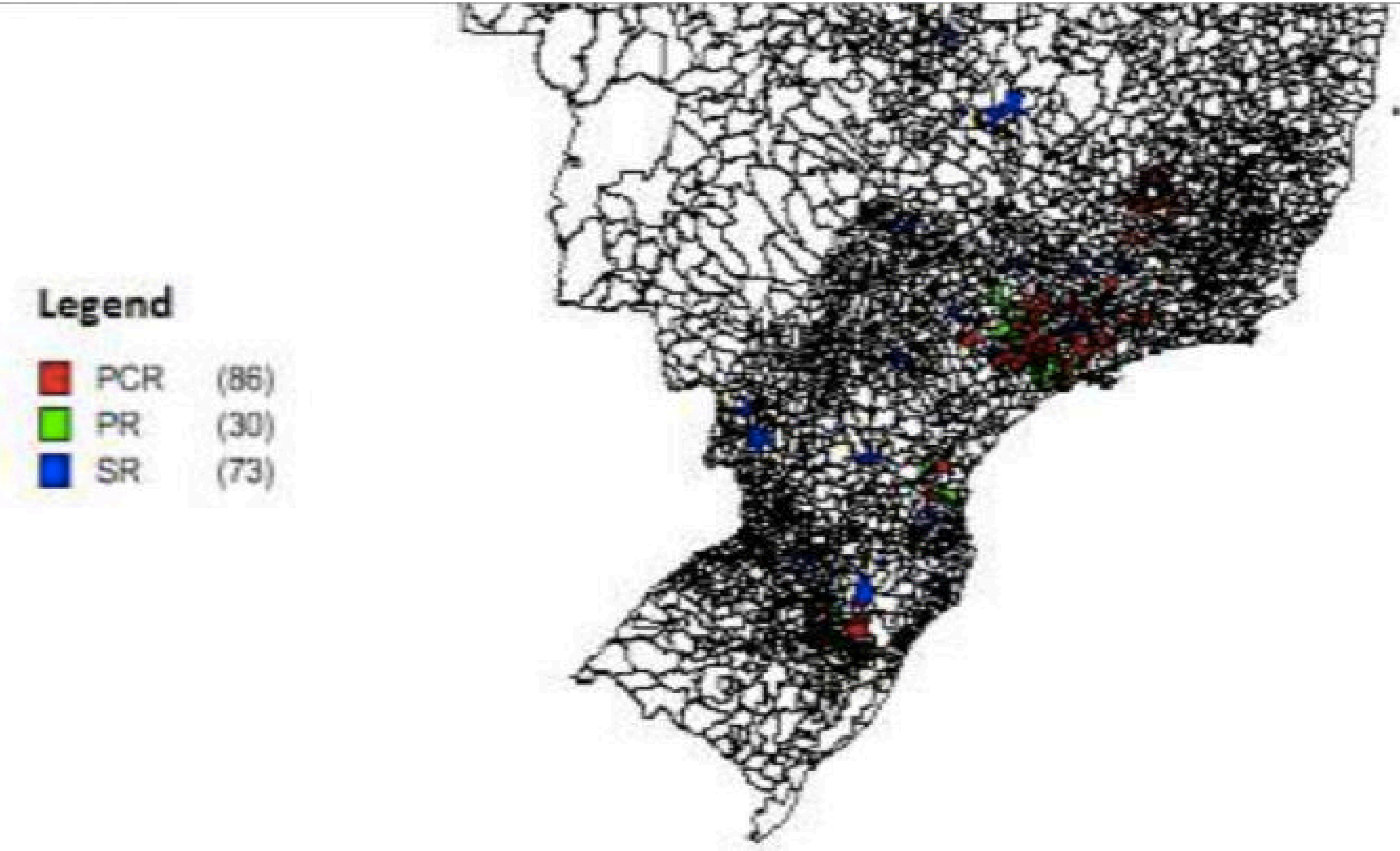
Location Quotient – compares sectoral employment share across regions
Lisa – assess similarity of employment across adjacent regions using weighted matrix

Pires, Cravo, Lodaro, Piza (2013) *Industrial Clusters and Economic Performance in Brazil*, IDB

Potential Industrial Clusters in Brazil

Sector	*Total*	*PCR*	*SR*	*PR*
10-Manufacture of food products	870	189	592	89
11-Manufacture of beverages	342	64	240	38
12-Manufacture of tobacco	64	12	48	4
13-Manufacture of textiles	377	90	249	38
14-Manufacture of wearing apparel	739	57	646	36
15-Manufacture of leather and footwear	369	84	275	10
16-Manufacture of wood products	988	267	655	66
17-Manufacture of paper and paper products	308	125	146	37
18-Printing and reproduction of recorded media	157	22	105	30
19-Manufacture of coke and refined petroleum products	206	89	107	10
20-Manufacture of chemicals and chemical products	333	77	217	39
21-Manufacture of basic pharmaceutical products	87	29	48	10
22-Manufacture of rubber and plastics products	332	103	185	44
23-Manufacture of other nonmetallic mineral products	1032	125	809	98
24-Manufacture of basic metals	248	83	126	39
25-Manufacture of fabricated metal products (metallurgy)	379	99	228	52
26-Manufacture of computer, electronic, and optical	108	41	45	22
27-Manufacture of electrical equipment	184	56	96	32
28-Manufacture of machinery and equipment	348	108	203	37
29-Manufacture of motor vehicles, trailers and semi-trailers	189	86	73	30
30-Manufacture of other transport equipment	81	19	51	11
31-Manufacture of furniture	546	113	370	63
32-Other manufacturing	292	64	184	44
33-Repair and installation of machinery and equipment	268	62	152	54
62-Computer programming, consultancy and related	56	14	27	15
63-Information service activities	126	15	83	28

Pires, Cravo, Lodaro, Piza (2013) *Industrial Clusters and Economic Performance in Brazil*, IDB

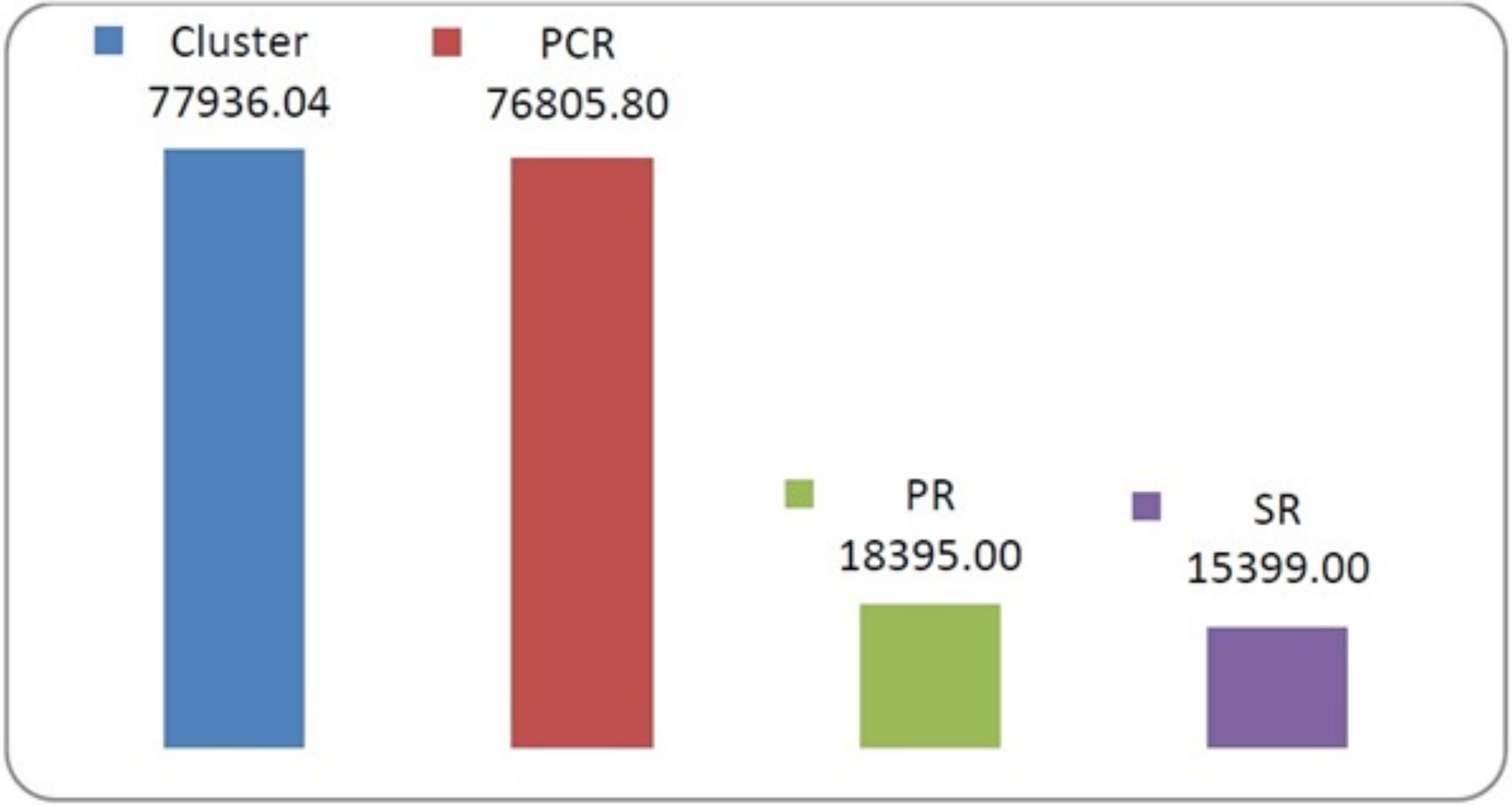


Pires, Cravo, Lodaro, Piza (2013) *Industrial Clusters and Economic Performance in Brazil*, IDB

Effect of Clusters on Creation of Formal Employment

Pires, Cravo, Lodaro, Piza (2013) *Industrial Clusters and Economic Performance in Brazil*, IDB

Effect of Clusters on Creation of Formal Employment in Industrial Sectors



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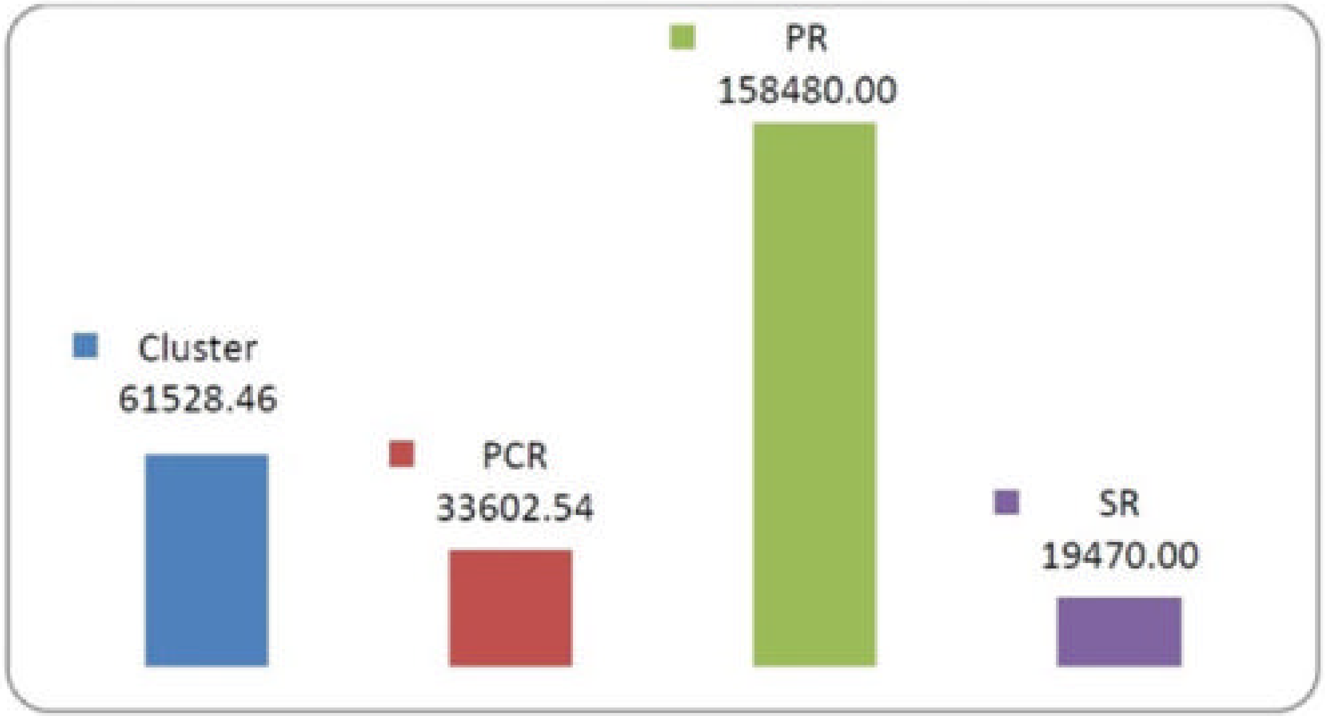
Effect of Clusters on Creation of Formal Employment Outside Cluster Regions



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