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# ***University-Industry joint scientific publications in Brazil***

Carlos Henrique de Brito Cruz  
FAPESP  
CAPES-Clarivate Symposium  
04 de setembro de 2019

# *The search for Science impact: three dimensions*

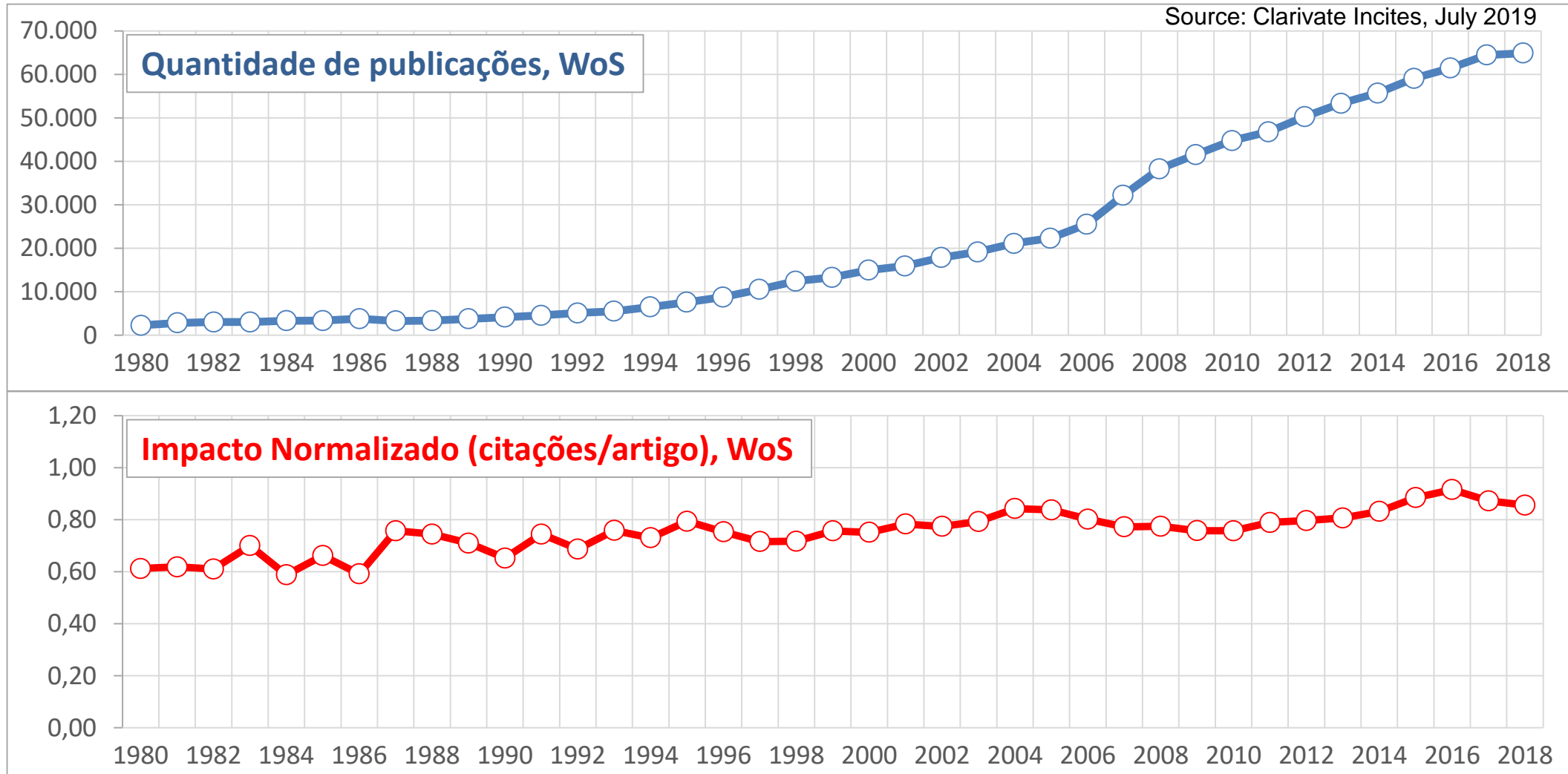
- Intellectual impact
  - Ideas that originate more ideas
  - Ideas that make humankind wiser
  - Ideas strongly cited in the literature
- Social impact
  - Ideas that increase well being, assist or inform public policy, increase the benefit from public goods
- Economic impact
  - Ideas that lead to new businesses
  - Ideas that increase economic competitiveness
  - Ideas that originate new industry sectors

- Search for more intellectual, social, economic impact
- Research collaboration as one of the relevant tools
  - Assess research collaboration through co-authorship in publications
- Research collaboration across geographies and sectors
  - Interstate collaboration
  - International collaboration
  - University-Industry collaboration
    - The places of research
    - Which companies and which universities collaborate
    - A small-business case
    - Strong growth in co-authorship for the last 30 years

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***FOSTER COLLABORATION TO OBTAIN MORE  
SCIENTIFIC, SOCIAL, AND ECONOMIC IMPACT***

# *Publications with authors in Brazil and their citation impact, 1980-2018*



# *A strategy for increasing research collaboration*

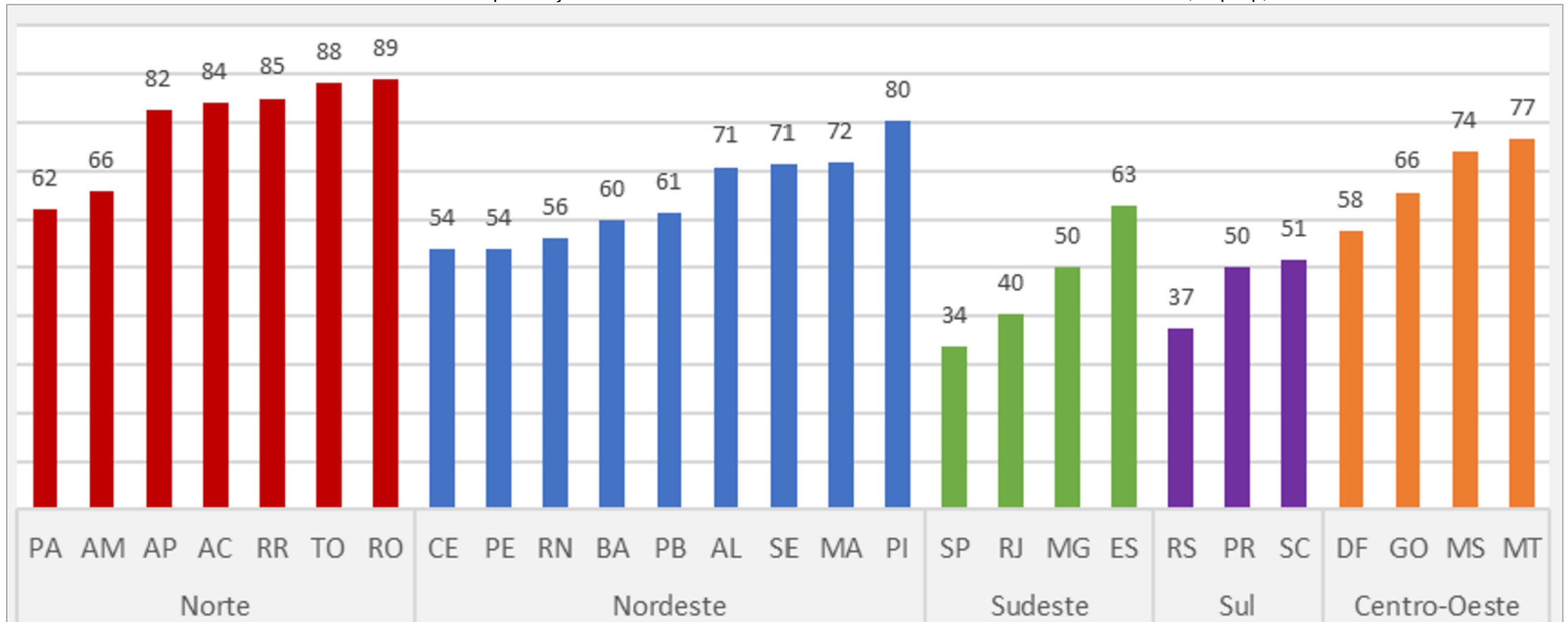
- Collaboration across geographies and institutions
  - National collaboration: agreements among FAPs and between FAPs and national funding bodies (CAPES, CNPq, FINEP, Health, Defense, Agriculture)
  - International collaboration: proactive attitude; aim at more protagonism by Brazilian researchers
  - Collaboration with users/appliers of knowledge
    - Business: research partnerships and Fostering of science based start-ups
    - Government: Science in/for higher quality government
- Collaboration win-win
  - More quality, more impact, more visibility, more funders

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# ***COLLABORATION AMONG BRAZILIAN STATES***

# Co-authorship across Brazilian states is relevant: % in co-authorship, by state

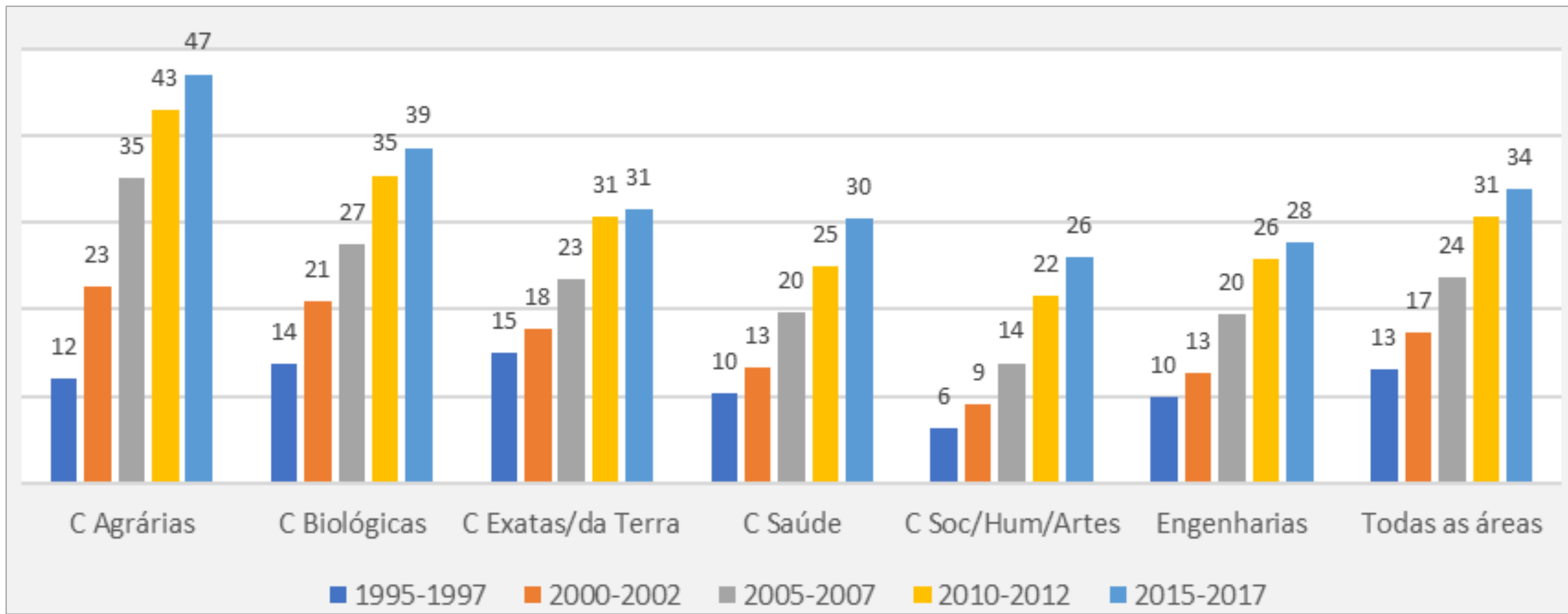
Pedrosa, R.H.L.; Dini, N.P.; Santa-Cruz, J. (2019). Colaborações científicas entre unidades da federação: uma análise a partir da base de publicações Web of Science/Incites - Sumário. Gerência de Estudos e Indicadores, Fapesp, São Paulo.





# Co-authorship with other states in São Paulo: 13(1995-97)->34%(2015-17) of articles; growth in all fields

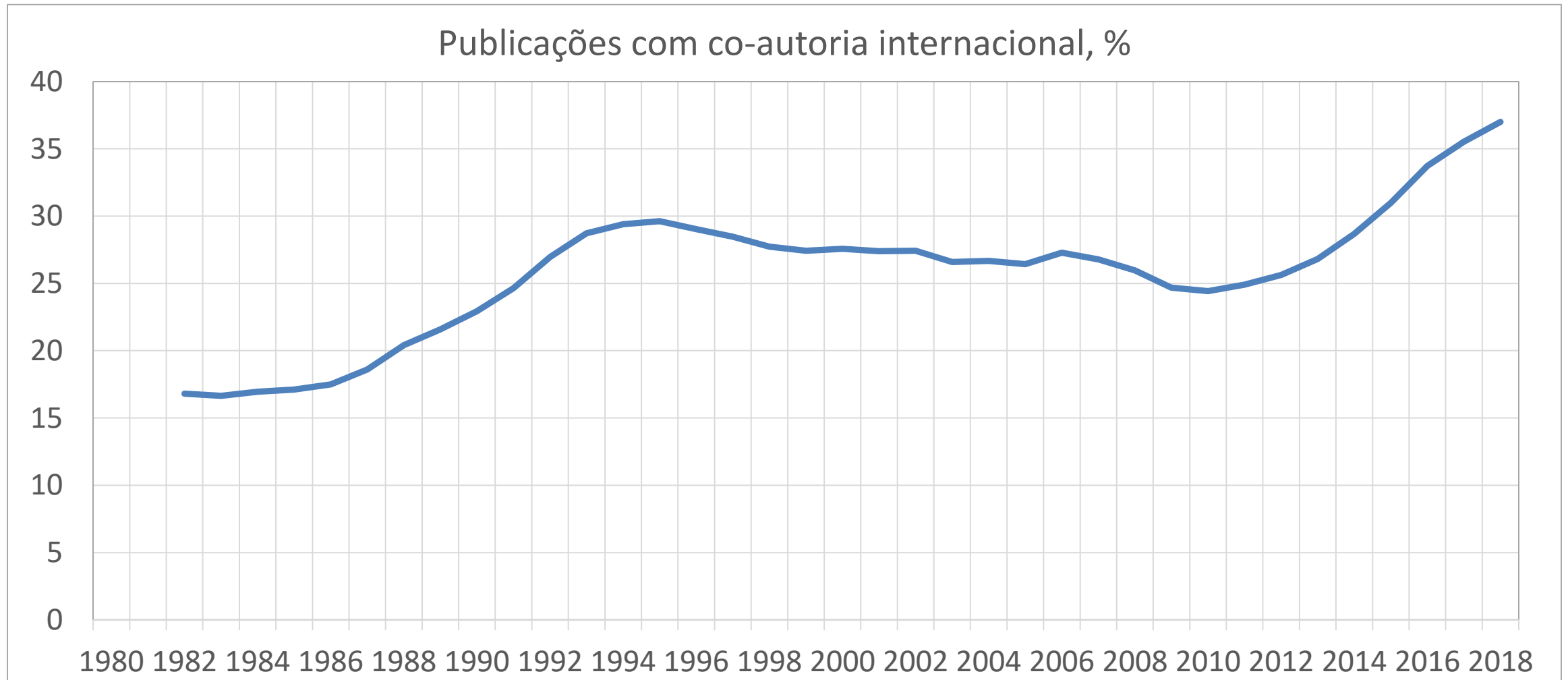
Pedrosa, R.H.L.; Dini, N.P.; Santa-Cruz, J. (2019). Colaborações científicas entre unidades da federação: uma análise a partir da base de publicações Web of Science/Incites - Sumário. Gerência de Estudos e Indicadores, Fapesp, São Paulo.



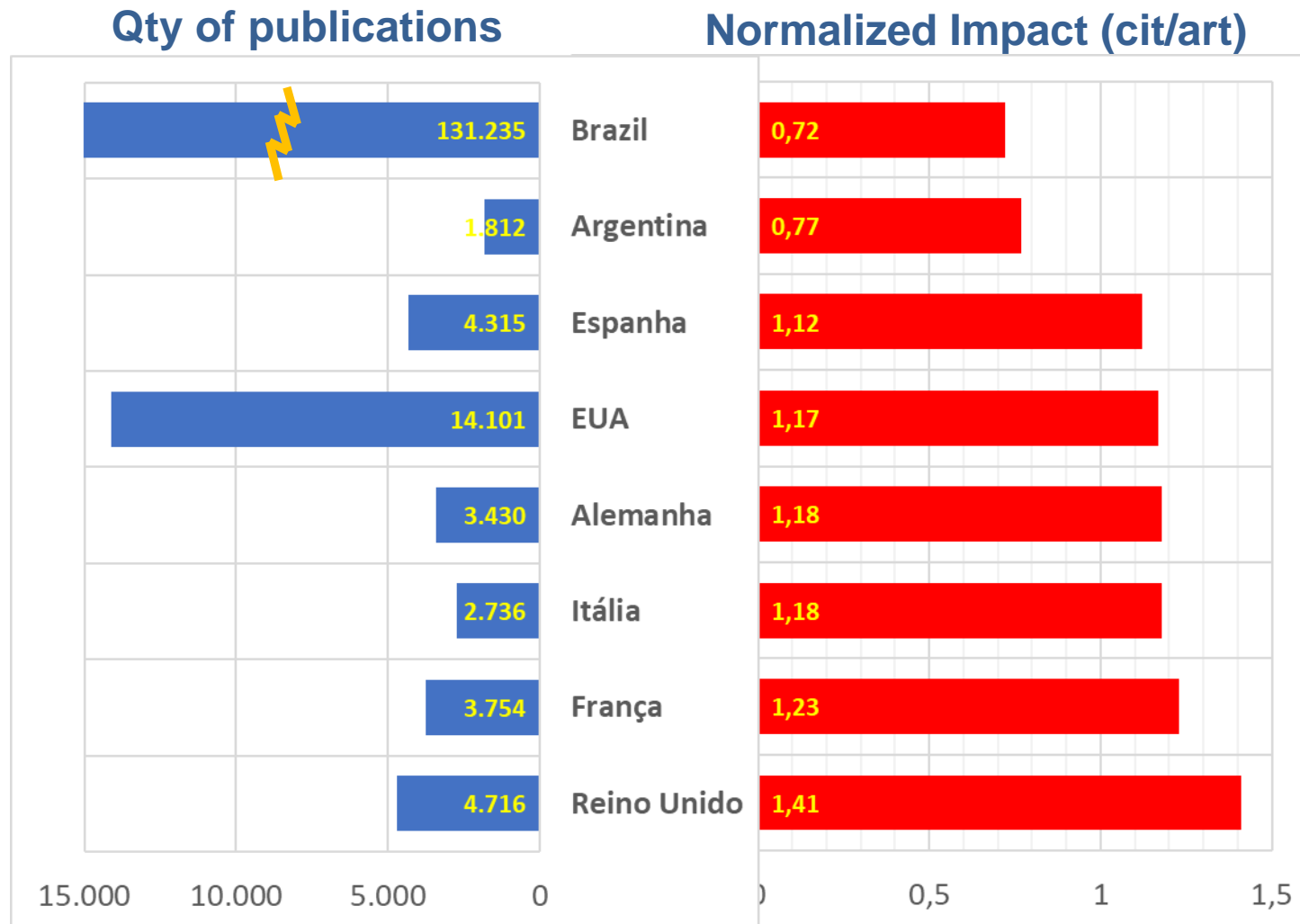
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# ***COLLABORATION BETWEEN AUTHORS IN BRAZIL AND IN THE WORLD***

# ***Publications with authors in Brazil and authors in other countries***



# Co-authorship Brazil-World; articles with less than 10 authors



- Restriction to <10 authors allows view for small science (no large collaborations)
- International collaboration can double the citation impact

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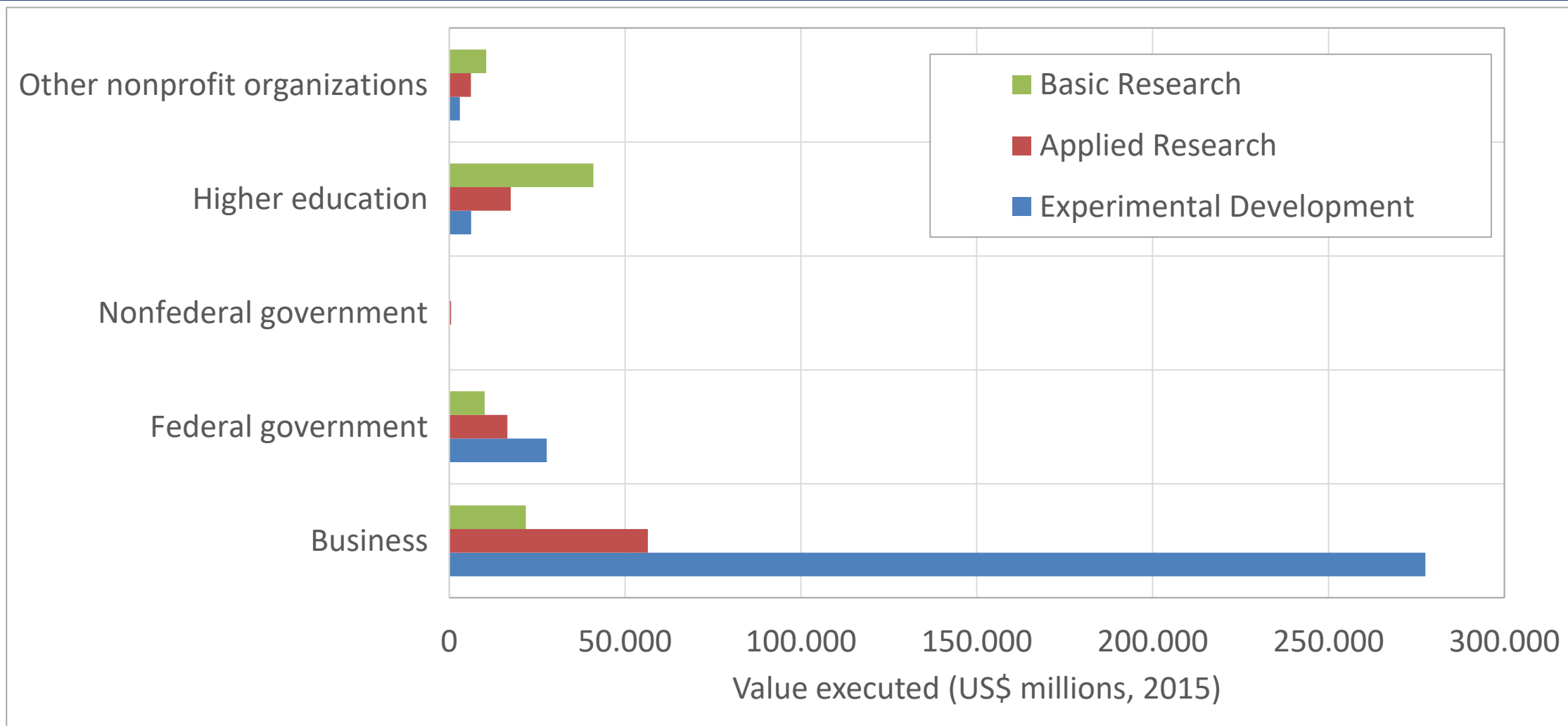
Having ideas together, demonstrating them together, publishing together

# ***UNIVERSITY-INDUSTRY RESEARCH COLLABORATION***

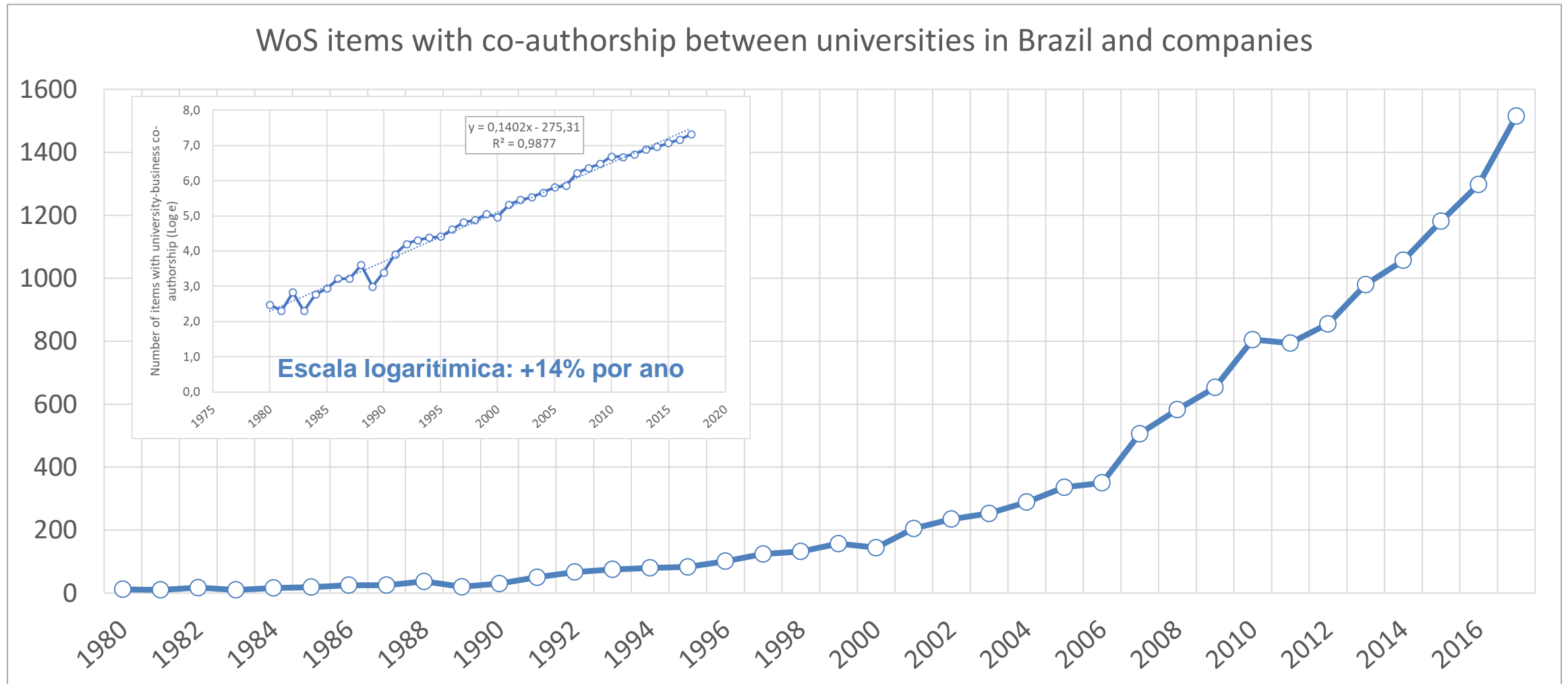
# *A brief note about the places of research: the case in the U.S.*

- Universities
  - Basic, Fundamental (strong), Applied (some), Development (weak)
- Business
  - Basic, Fundamental (weak), Applied (some+), Development (a lot)
- Mission oriented research institutes
  - Basic, Fundamental (weak), Applied (some), Development (some+)

# *R&D expenditures, by performer: U.S., 2015*



# University-Business co-authorship in Brazil – exponential growth





# Starting with a MSc dissertation on “Cooperative multirobot localization...”..

## Localização Multirrobô Cooperativa com Planejamento

Dissertação apresentada ao Instituto de Computação, UNICAMP, como requisito parcial para a obtenção do título de Mestre em Ciência da Computação.

Paulo Gurgel Pinheiro<sup>1</sup>

Março de 2009

Prof. Dr. Jacques Wainer (Orientador)

<sup>1</sup>Suporte financeiro de: Bolsa da FAPESP (processo 2007/53606-2) 2007-2009

## Planning for Mobile Robot Localization Using Architectural Design Features on a Hierarchical POMDP Approach

PhD Thesis presented to the Post Graduate Program of the Institute of Computing of the University of Campinas to obtain a PhD degree in Computer Science.

Paulo Gurgel Pinheiro<sup>1</sup>

August 16, 2013

Posto isto, pode-se apresentar o modelo de detecção negativa que é definido por  $p(x_t^{r_1^-} = x | d_t^-)$ :

$$p(x_t^{r_1^-} = x | d_t^-) = \frac{p(d_t^- | x_t^{r_1} = x, vis^{r_1}, obs)p(x_{t-1}^{r_1} = x | d_{t-1}^{r_1})}{\sum_{x'} p(d_t^- | x_t^{r_1} = x', vis^{r_1}, obs)p(x_{t-1}^{r_1} = x' | d_{t-1}^{r_1})} \quad (4.3)$$

em que  $r_1$  é o robô que executa a detecção negativa,  $x_t$  é a postura do robô  $r_1$  e  $d_t^-$  é a informação de ausência de detecção de outro. Os obstáculos são representados pela variável  $obs$  e o campo de visão do robô observador por  $vis^{r_1}$ .

Toda vez em que um robô não detectar um outro, as estimativas de crença sobre suas posturas são atualizadas. Quando o robô  $r_1$  não detectar o robô  $r_2$ , esta terá suas estimativas atualizadas de acordo com:

$$p(x_t^{r_2} = x | x_t^{r_1^-} = x) = \frac{p(x_t^{r_1^-} = x | d_t^-)p(x_{t-1}^{r_2} = x | d_{t-1}^{r_2})}{\sum_{x'} p(x_t^{r_1^-} = x' | d_t^-)p(x_{t-1}^{r_2} = x' | d_{t-1}^{r_2})} \quad (4.4)$$

em que  $x_t^{r_1}$  é a postura do robô  $r_1$  e  $x_t^{r_2}$  é a postura do robô  $r_2$ .

# ...to an idea...+ funding from FAPESP ...+ IP protection....

## Anticipative Shared Control for Robotic Wheelchairs Used by People with Disabilities

By: [Pinheiro, P](#) (Pinheiro, Paulo)<sup>[1]</sup>; [Cardozo, E](#) (Cardozo, Eleri)<sup>[1]</sup>; [Pinheiro, C](#) (Pinheiro, Claudio)<sup>[2]</sup>

2015 IEEE INTERNATIONAL CONFERENCE ON AUTONOMOUS ROBOT SYSTEMS AND COMPETITIONS (ICARSC)

Edited by: [Valente, A](#); [Morais, R](#); [Almeida, L](#); [Marques, L](#)

Book Series: IEEE International Conference on Autonomous Robot Systems and Competitions ICARSC

Pages: 91-96

DOI: 10.1109/ICARSC.2015.26

Published: 2015

### Author Information

Reprint Address: [Pinheiro, P](#) (reprint author)

+ Univ Estadual Campinas, Sch Elect & Comp Engr FEEC, BR-13083852 Campinas, SP, Brazil.

### Addresses:

+ [ 1 ] Univ Estadual Campinas, Sch Elect & Comp Engr FEEC, BR-13083852 Campinas, SP, Brazil

+ [ 2 ] Fed Inst Educ Sci & Tecnol Ceara IFCE, Dept Telecommun Res, BR-60040215 Fortaleza, Ceara, Br

**Artigo publicado**

## Wheelie e Gimme, tecnologia inovadora para dirigir cadeira de rodas

Processo: 15/22624-1 **+ 5 auxílios FAPESP**

Linha de fomento: [Auxílio à Pesquisa - Pesquisa Inovativa em Pequenas Empresas - PIPE](#)

Vigência: 01 de agosto de 2016 - 30 de abril de 2017

## The Wheelie - A Facial Expression Controlled Wheelchair Using 3D Technology

By: [Pinheiro, PG](#) (Pinheiro, Paulo Gurgel)<sup>[1]</sup>; [Pinheiro, CG](#) (Pinheiro, Claudio Gurgel)<sup>[1]</sup>; [Cardozo, E](#) (Cardozo, Eleri)<sup>[2]</sup>

2017 26TH IEEE INTERNATIONAL SYMPOSIUM ON ROBOT AND HUMAN INTERACTIVE COMMUNICATION (RO-MAN)

Edited by: [Howard, A](#); [Suzuki, K](#); [Zollo, L](#)

Book Series: IEEE RO-MAN

Pages: 271-276

Published: 2017

### Author Information

Reprint Address: [Pinheiro, PG](#) (reprint author)

+ Univ Estadual Campinas, HOBOX Robotics

### Addresses:

+ [ 1 ] Univ Estadual Campinas, HOBOX Robotics

+ [ 2 ] Univ Estadual Campinas, Dept Ele

Patente(s) depositada(s) como resultado deste projeto de pesquisa

**3 patentes**

[MÉTODO DE ANÁLISE FACIAL PARA CONTROLE DE DISPOSITIVOS](#) PCT/BR2017/000136 - [Hoobox Robotics Tecnologia do Brasil Ltda ME](#); [Universidade Estadual de Campinas \(UNICAMP\)](#). Eleri Cardozo; Paulo Gurgel Pinheiro - 17 de novembro de 2017

[MÉTODO DE ANÁLISE FACIAL PARA CONTROLE DE DISPOSITIVOS](#) BR1320170243183 - [Hoobox Robotics Tecnologia do Brasil Ltda ME](#); [Universidade Estadual de Campinas \(UNICAMP\)](#). Eleri Cardozo; Paulo Gurgel Pinheiro - 13 de novembro de 2017

[MÉTODO DE ANÁLISE FACIAL PARA CONTROLE DE DISPOSITIVOS](#) BR1020160270650 - [Universidade Estadual de Campinas \(UNICAMP\)](#). PAULO GURGEL PINHEIRO; ELERI CARDOZO - 18 de novembro de 2016


**Artigo publicado**

# ...ao produto e empresa....

**IT SQUARE**  
MENU

## Making HK IT!

### 新世代AI 商品 打入2019電子市場



HooBox是全球首部以臉部表情控制駕駛的自動輪椅，只要向輪椅做出表情，就可以來去自如（網上截圖）

美國拉斯維加斯CES消費電子展剛剛閉幕，不少新世代的電子產品，令人留下深刻印象。機器學習和AI不再單是流行用語，各行各業新產品；包括農業、無人駕駛機，交通工具，醫療設備等等，都加入AI

 **GADGETGUY**

## ANNOUNCEMENT: Quadriplegics to get around with a smile: Intel powers HOOBOX Wheelie 7

RAY SHAW ✕ December 3, 2018 5 MIN READ

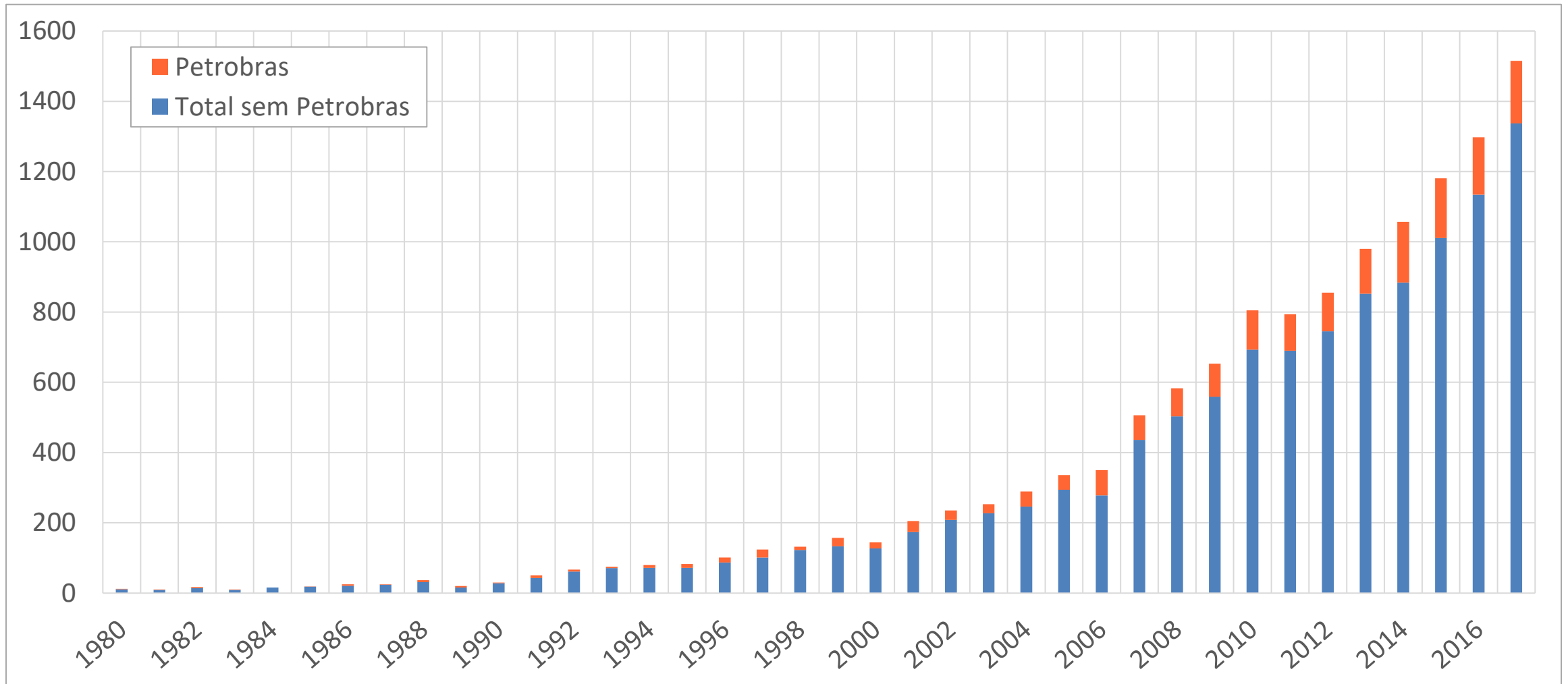
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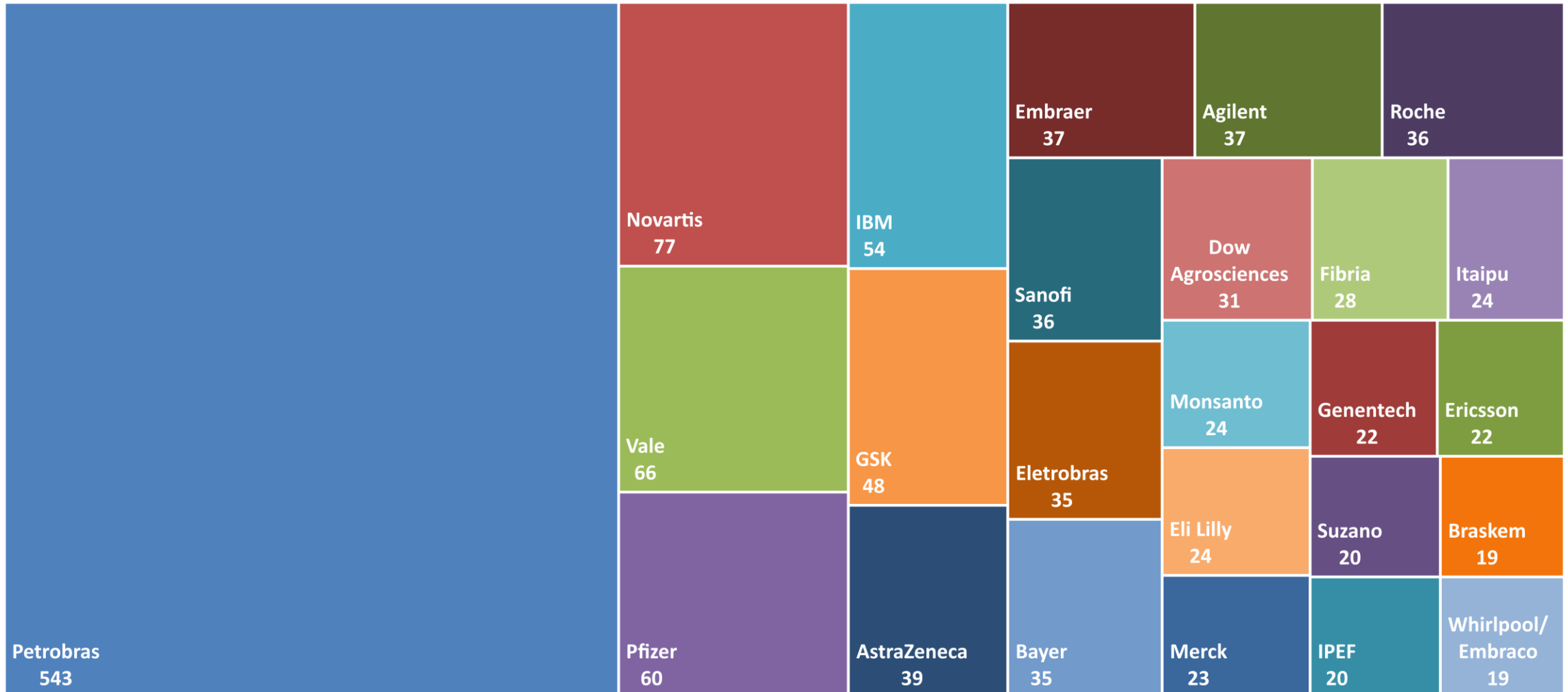
We use cookies to ensure that we give you the best experience on



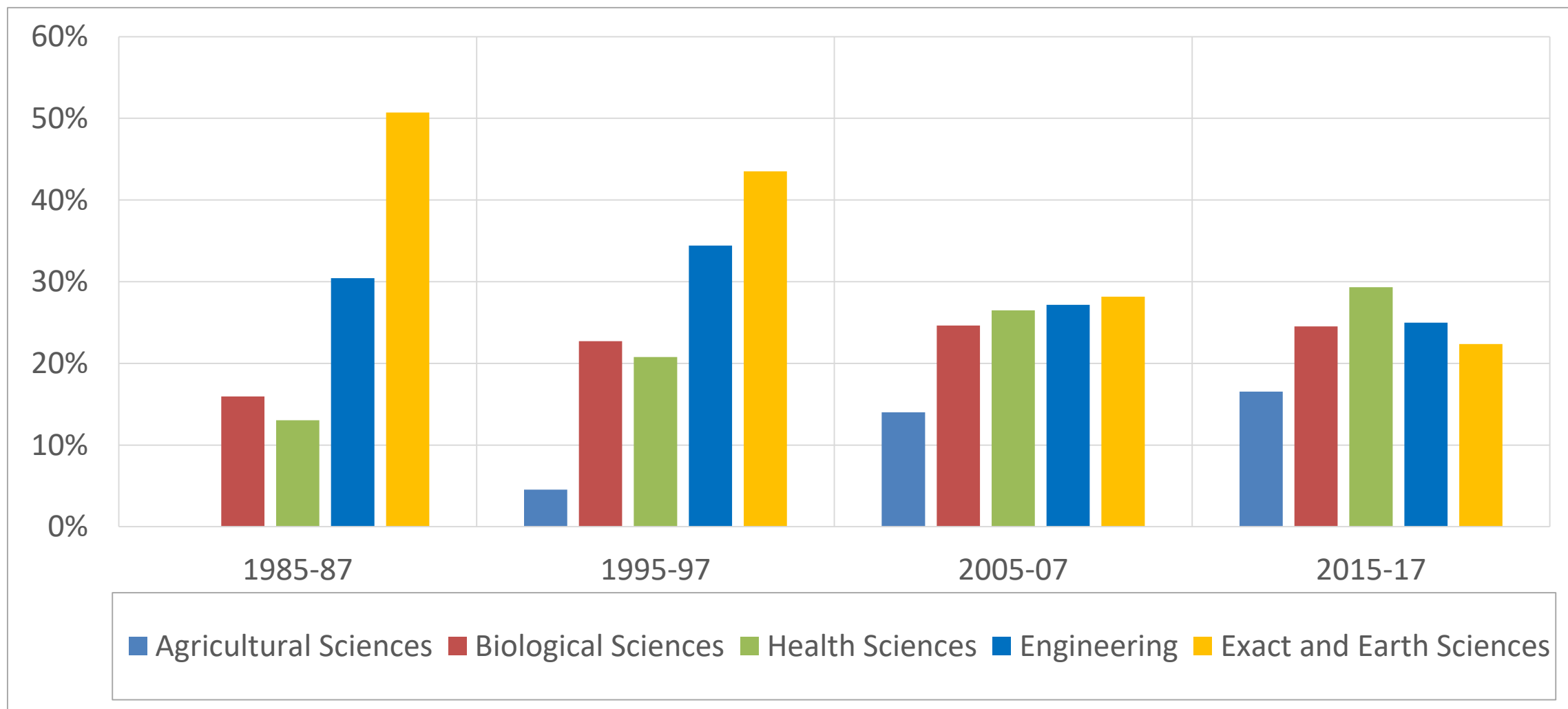
# *Petrobrás responded for 13% of the co-authorships, 2015 a 2017*



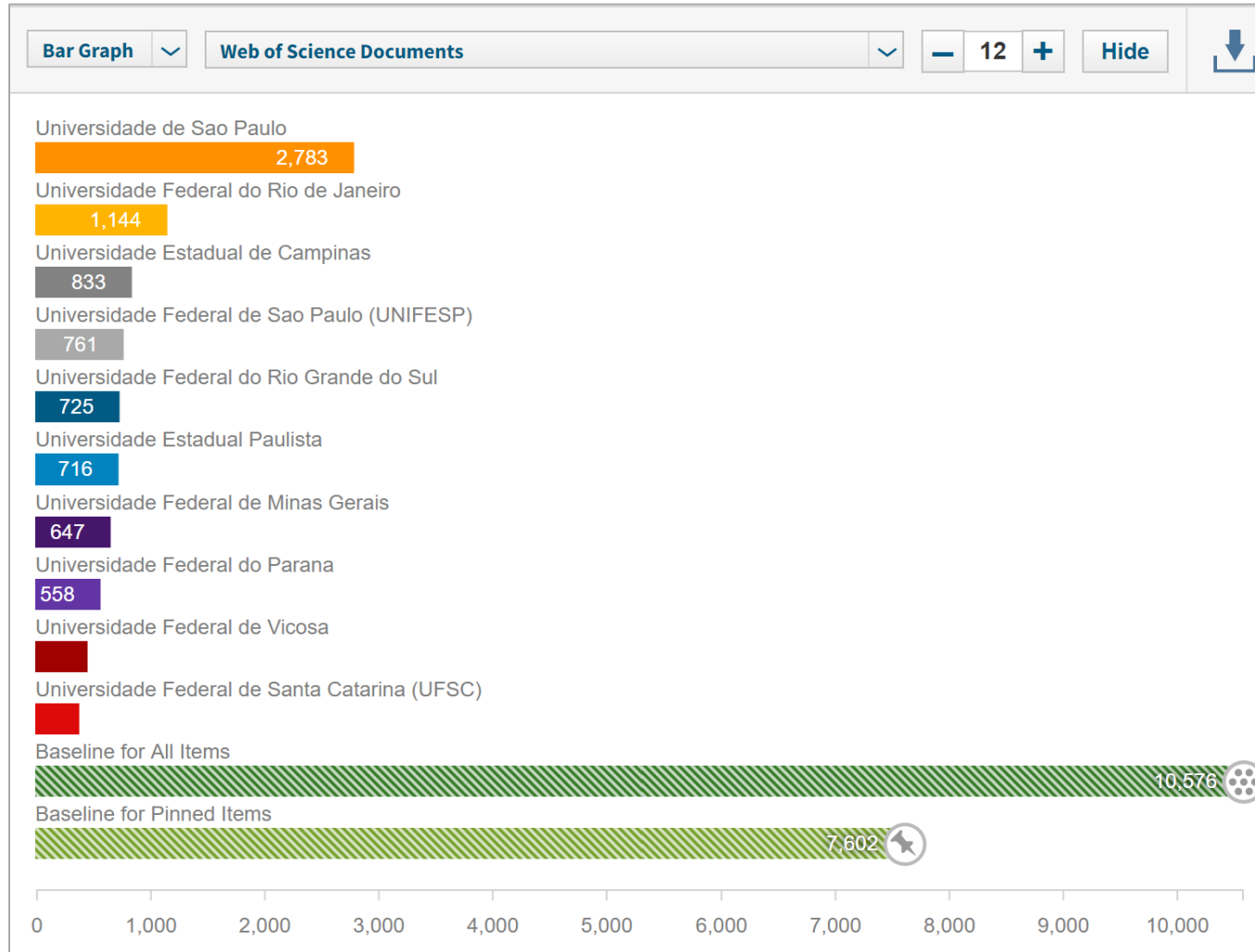
# 25 companies with more co-authorships: 10 Brazilian, 15 Multinational



# *University-Industry co-authorship: towards a balanced distribution among the main fields of research*



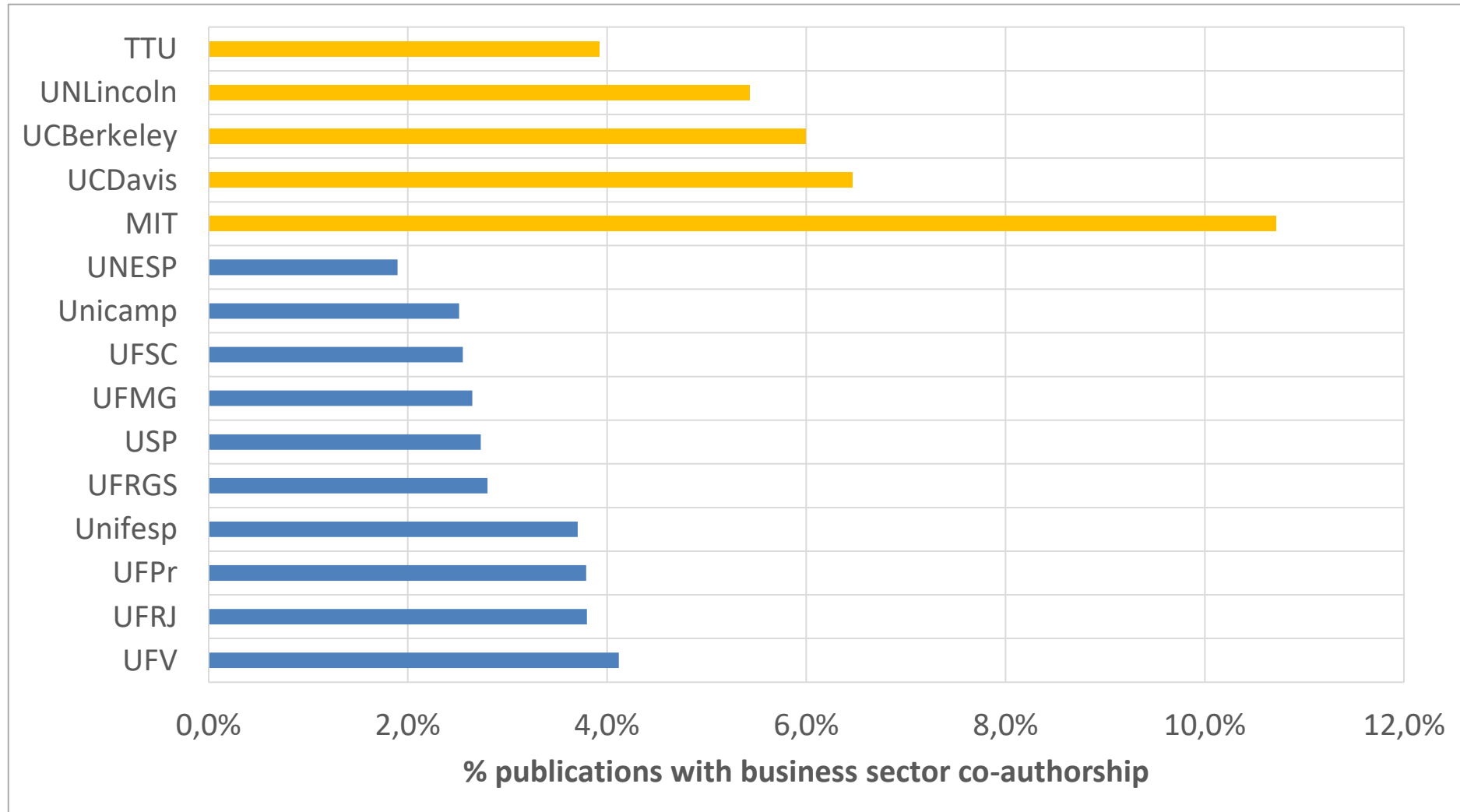
# 2009-2018: 10 universities respond for 72% of the university-industry co-authorship



- USP
- UFRJ
- Unicamp
- UNIFESP
- UFRGS
- UNESP
- UFMG
- UFPr
- UFV
- UFSC



# *University-Industry co-authorship: universities in Brazil and in the U.S.*



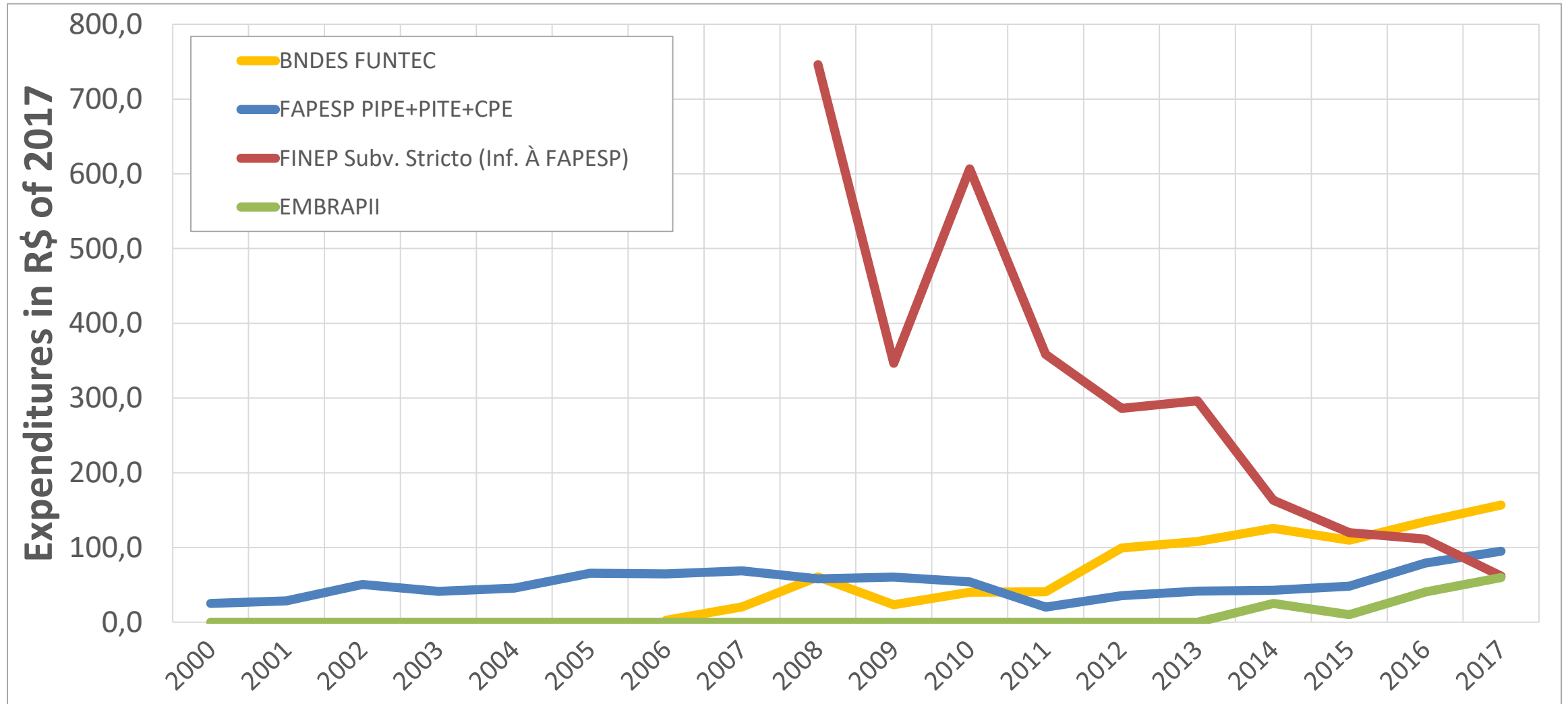


# ***Brazil: growing university-business research collaboration***

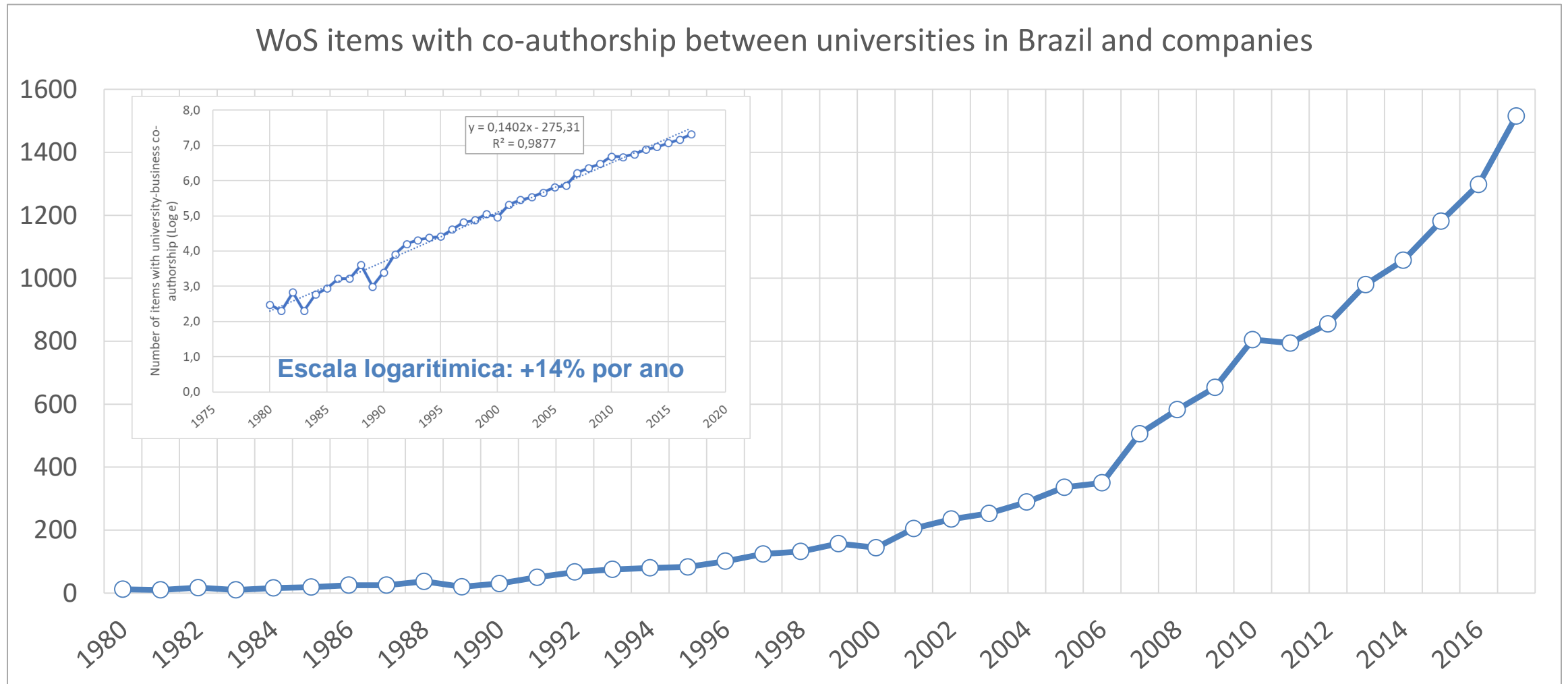
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- Exponential growth from 1980-2018
  - +14% per year in the number of co-authored publications
  - Strong numbers in business funded R&D at universities
  - Strong presence of multinational companies
- Threat
  - Reduction in government funding for joint university-industry R&D

# *Brazil: expenditures by government agencies towards university-industry joint research*



# University-Business co-authorship in Brazil – *exponential growth*



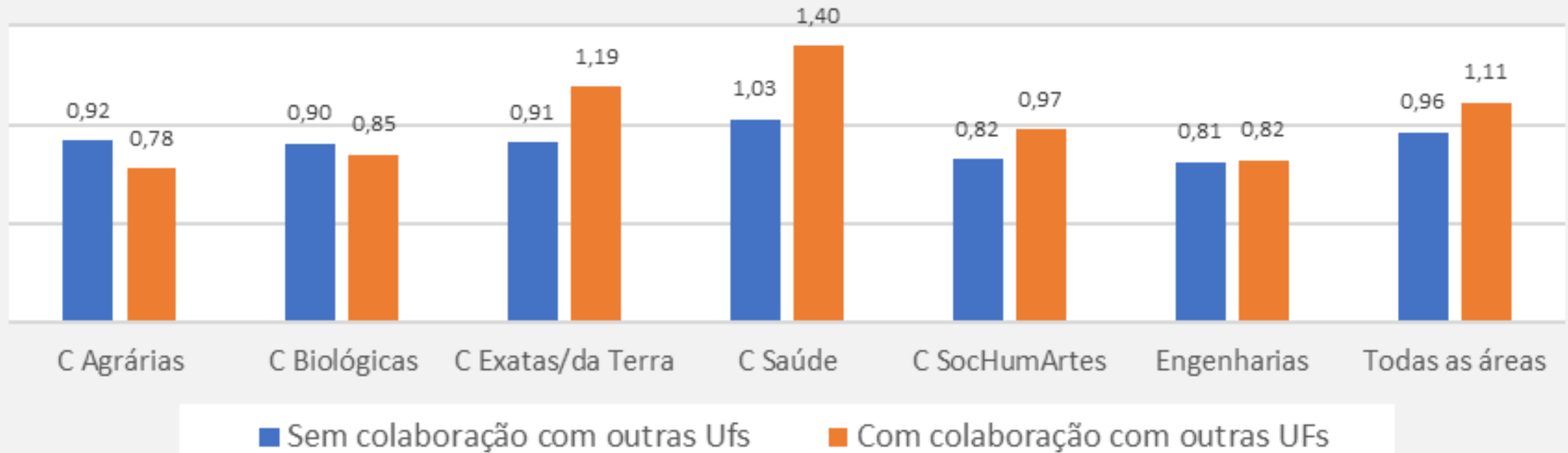
# *Conclusion: growth in national, international, cross-sector research collaboration assessed through co-authorships*

- A result of continued policies for research capacity development and collaboration
- University-industry co-authorship
  - Clarivate's database offers the possibility to look into co-authorship
    - Needs elaborate search procedure to go beyond the built-in feature (but works)
  - For the first time, a metrics based assessment of university-industry interactions in Brazil
  - Growth has been exponential since 1980: +14% per year
  - Balanced contribution from Multinational and Brazilian companies
    - Relevance of Petrobras
    - Noticeable presence of small-businesses based in Brazil
  - List of main universities is dominated by public research universities
    - USP, UFRJ, Unicamp, Unifesp, UFRGS, UNESP, UFMG, UFPr, UFV, UFSC: 72% of total
  - Distribution across fields of research became more balanced in recent years
  - There seems to be room for more growth



# *As colaborações entre as UFs e SP aumentam o número de citações das publicações*

Impacto relativo normalizado por categoria (citações por documento, média mundial = 1,00)  
Publicações de São Paulo, segundo colaboração com outras UFs - 2015-2017



# *Pesquisa na Universidade e Pesquisa na Empresa*

## *Complementaridade virtuosa*

### Pesquisa na universidade

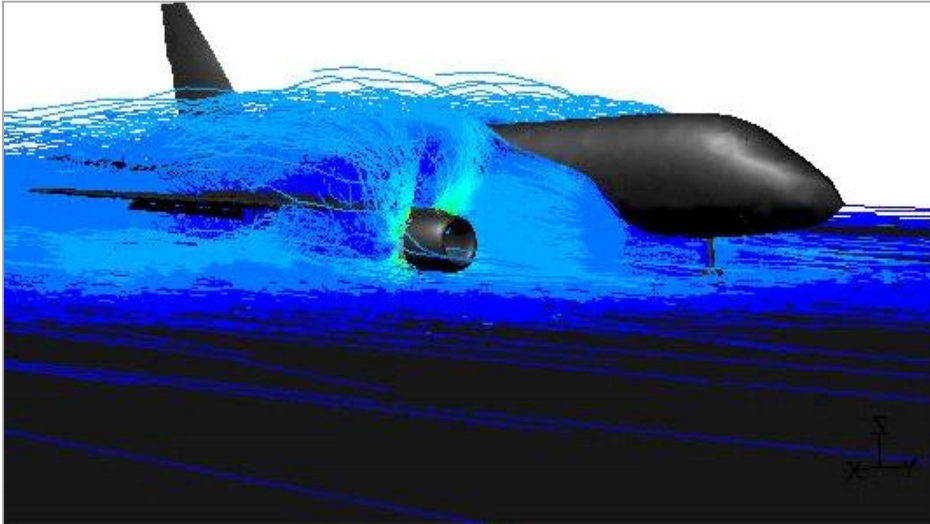
- Descobrir e Educar
- Tempo flexível
  - Competição
  - Educação
- Comunicar muito, esconder pouco
  - Pesquisa básica precisa de comunicação para avançar
  - Educação requer comunicação
- Custo do fracasso na descoberta é mitigado pela educação

### Pesquisa na Empresa

- Inovar e Melhorar
- Tempo inflexível
  - Competição
  - Competição
- Esconder mais, comunicar pouco
  - Inovação para competitividade requer algum grau de confidencialidade
- Custo do fracasso no projeto é alto

# *PITE: Embraer e IAE, CTA*

## *Fluidodinâmica Computacional*



Simulação CFD  
(Computational  
Fluid Dynamics)  
e testes:  
Pesquisa co-  
financiada pela  
FAPESP  
envolvendo  
várias  
universidades



Prêmio CNI 2005  
Estadual e Nacional  
Inovação Tecnológica  
Rede de Pesquisa - Empresa

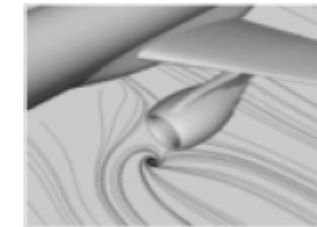
Projeto FAPESP (PICTA)

- 8 instituições: Embraer, CTA, USP – Poli e São Carlos, UNICAMP, UFSC, UFU e PUC-Rio

- 4 fundações: FCMF, UNIEMP, FAU e FEESC.

- 3 empresas: ESSS, CITS e DELTACORE.

- Período de 3,5 anos / 100 especialistas.





# Aerodynamics, Computational Fluid Dynamics

International Journal for Numerical Methods in Fluids [Explore this journal >](#)

Research Article

## Adaptive mesh refinement and coarsening for aerodynamic flow simulations

Leonardo Costa Scalabrin, João Luiz F. Azevedo 

First published: 14 May 2004 [Full publication history](#)

DOI: 10.1002/fld.731 [View/save citation](#)

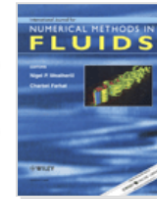
Cited by: 3 articles [Refresh](#) [Citing literature](#)



[Funding Information](#)

### Abstract

A new mesh refinement technique for unstructured grids is discussed. The new technique presents the important advantage of maintaining the original grid skewness, thanks to the capability of handling hanging nodes. The paper also presents an interpretation of MacCormack's method in an unstructured grid context. Results for a transonic convergent-divergent nozzle, for a convergent nozzle with a supersonic entrance and for transonic flow over a NACA 0012 airfoil are presented and discussed. Copyright © 2004 John Wiley & Sons, Ltd.



[View issue TOC](#)  
Volume 45, Issue  
10 August 2004  
Pages 1107–11.

## Navier–Stokes-Based Study into Linearity in Transonic Flow for Flutter Analysis

Roberto G. A. Silva,\* Olympio A. F. Mello,<sup>†</sup>  
and João L. F. Azevedo<sup>‡</sup>  
*Centro Técnico Aeroespacial,  
12228-904 São José dos Campos SP, Brazil*

### Introduction

It has been known for quite some time<sup>1</sup> that transonic flow conditions are critical for flutter, with the flutter dynamic pressure being substantially reduced for Mach numbers near unity, in a phenomenon usually termed as “transonic dip.”<sup>2</sup> The severity of flut-

# *Universities, Innovation, and the Competitiveness of Local Economies*

**It is often said that the best form of technology transfer is the moving van that transports the PhD from his or her university laboratory to a new job in industry.**

Cited by R. Lester, 2005

# *Hoobox is at J&J Innovation Labs, Houston e com escritórios na China e EUA*



# Laboratório de Estrutura Leves: IPT, ITA, Embraer; financ. BNDES, FINEP, FAPESP



## About IPT

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## Fields of Activity

## Technology Centers

## Location

Av. Prof. Almeida Prado, 532



Home > Technology Centers > Center for Integrity of Structures and Equipment > Labs and Sessions

## Lightweight Structures Laboratory - LEL



Automatic Fiber Placement Machine

Lightweighting is key to modern structures. Affordable structures, with less weight and less cost, are vital to the achievement of a sustainable society. The materials to be used on these structures on the future must have its origins on renewable sources and must be safely recycled or disposed.

An important agent of innovation in lightweight structures is the aerospace/aeronautics sector,

whose current and future competitiveness depends directly on dominating these

# Record distance: 140 km link using TFPS CPqD and BrPhotonics @ ECOC 16

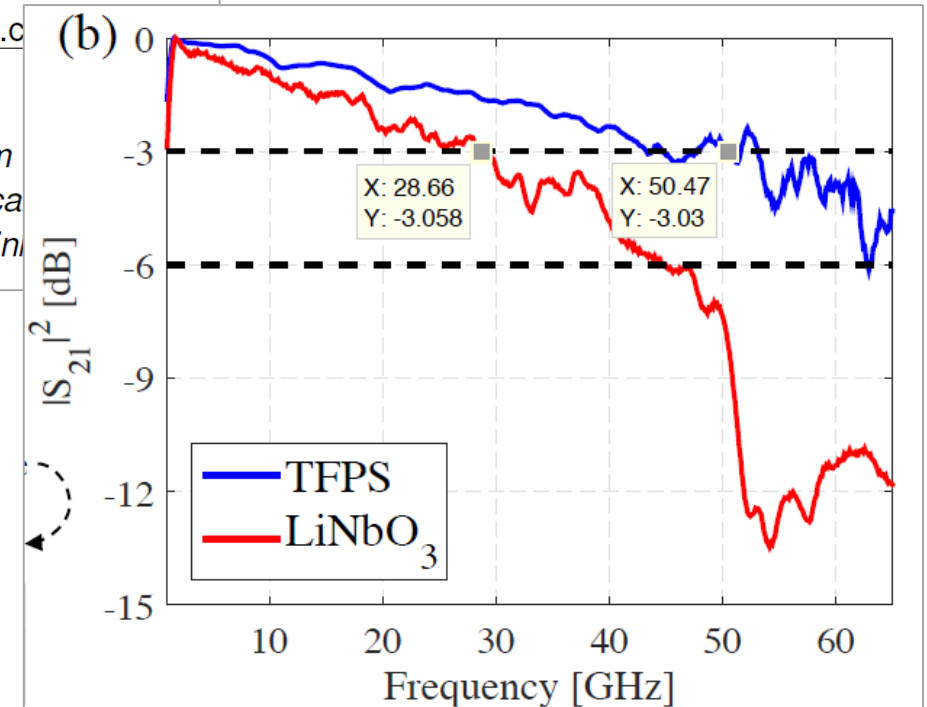
## 50-GHz+ Thin-Film Polymer on Silicon Modulator for PAM4 100G-per-wavelength Long-Reach Data Center Interconnects

Andrea Chiuchiarelli<sup>(1)</sup>, Sandro M. Rossi<sup>(1)</sup>, Valery N. Rozental<sup>(1)</sup>, Glauco C.C.P. Simões<sup>(1)</sup>,  
Luis H.H. Carvalho<sup>(2)</sup>, Júlio C.R.F. Oliveira<sup>(2)</sup>, Juliano R.F. Oliveira<sup>(1)</sup>, Jacklyn D. Reis<sup>(1)</sup>

<sup>(1)</sup>CPqD, Division of Optical Technologies, Campinas-SP, 13902-086, Brazil, [jacklyn@cpqd.com.br](mailto:jacklyn@cpqd.com.br)

<sup>(2)</sup>BrPHOTONICS, Campinas-SP, 13086-902, Brazil.

**Abstract** This paper demonstrates 50-GHz+ Mach-Zehnder modulator based on thin-film Silicon platform for Data Center Interconnects. System level demonstration is successfully carried out over 40×112 Gb/s, 56-GBd PAM4 optical channels in 100-GHz WDM grid over record 140-km link.





# Coherent Optical Technologies

## PADTEC, Unicamp, FAPESP

Lasers, Fiber Optics, And Communications

### All-optical mitigation of amplitude and phase-shift drift noise in semiconductor optical amplifiers

Peterson Rocha ; Cristiano M. Gallep ; Evandro Conforti

[\[-\] Author Affiliations](#)

**Peterson Rocha, Evandro Conforti**

University of Campinas, Faculty of Electrical and Computing Engineering-FEEC, Av. Albert Einstein 400, Campinas, SP 13083-970, Brazil

**Cristiano M. Gallep**

University of Campinas, School of Technology, R. Paschoal Marmo 1888, Limeira, SP 13484-332, Brazil

*Opt. Eng.* 54(10), 106110 (Oct 27, 2015). doi:10.1117/1.OE.54.10.106110

History: Received June 17, 2015; Accepted September 24, 2015

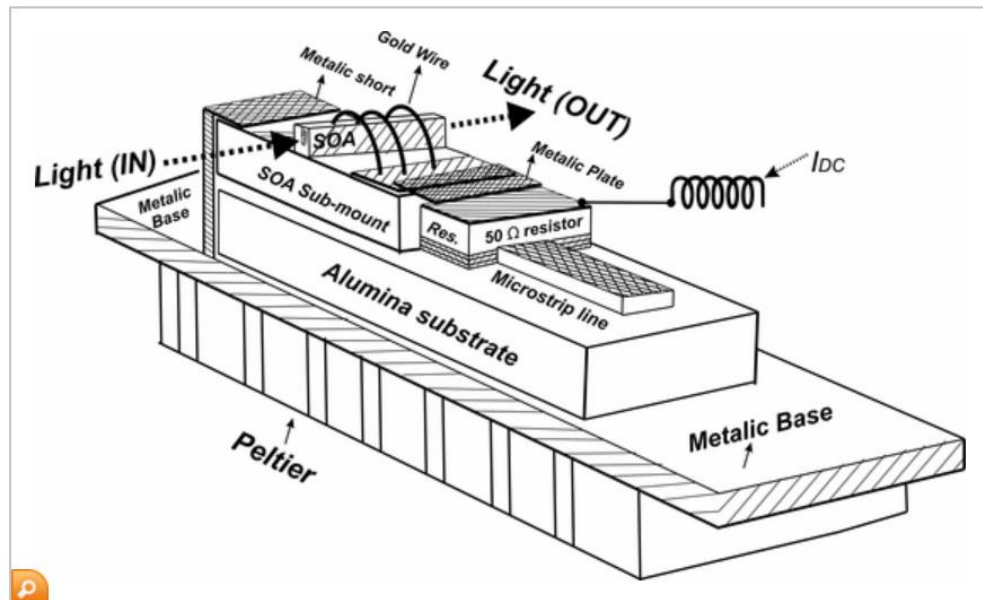


Fig. 8. SOA microwave mount and its components.

JOURNAL OF LIGHTWAVE TECHNOLOGY, VOL. 33, NO. 1, JANUARY 1, 2015

### Hundred-Picoseconds Electro-Optical Switching With Semiconductor Optical Amplifiers Using Multi-Impulse Step Injection Current

Rafael C. Figueiredo, Napoleão S. Ribeiro, Antonio Marcelo Oliveira Ribeiro, Cristiano M. Gallep, *Member, IEEE*, and Evandro Conforti, *Life Senior Member, IEEE*

69

Photonics Technology Letters, ...> Volume:21 Issue:12, 2009

### Rise Time and Gain Fluctuations of an Electrooptical Amplified Switch Based on Multipulse Injection in Semiconductor Optical Amplifiers

Ribeiro, N.S. ; Dept. of Microwaves & Opt., Univ. of Campinas, Campinas, Brazil ; Toazza, A.L. ; Gallep, C.M. ; Conforti, E.

# Biologia Molecular Avançada para Saúde e Agricultura



Supported by:

02/25/2015 09h47



## Latin America's first kinase laboratory

Center located at Unicamp involves an investment of R\$ 18 million from Fapesp

### Unicamp

On March 10, Unicamp will launch the first research center of biology in Latin America (LA) in the area of protein kinases, molecules that are highly required in the pharmaceutical industry due to their signaling characteristics and the regulation of important biological processes. The laboratory, called Biology Center in Protein Kinase, relies on the partnership with São Paulo Research Foundation (Fapesp) and the Structural Genomics Consortium (SGC).

abbvie



# *Impacto da pesquisa feita em colaboração entre diferentes UFs é, em geral, maior*

