# InSysPo
# Policy Evaluations, Tech-upgrade and Catching up in LA:
# org capabilts; institutional support

São Paulo

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# Summary

1. Hypotheses
2. Structural macrodata about Brazilian environment for tech upgrade and innovation
3. 3 cases of STI Policy evaluation
4. Lessons
5. Conclusions

# Hypothesis 1

**Considering**

- Macro level STI policies for development (looking at catching up) requires :
  1. Strong orchestration amongst levels and agents (via a coordinator agent or via market)
  2. Institutional support
  3. Agreement amongst agents
  4. Stability over time

**Then:**

- In the absence of these conditions, macro policy effectiveness will hardly be achieved
- The more complex the orchestration, the less likely is the effectiveness of policies
- And this is not only a matter of design
- The problem is moreover structural

# Hypothesis 2

If Hypothesis 1 is correct

**Then:**

- The more feasible the coordination is, the more effective policies tend to be
- And this is a matter of design

# A corollary would be

- If those requirements are not in the page, do not go for complex top down policies
- Go instead for more managable policies, even if they are apparently less impacting
- Coordination is the top thing missing

# What evaluations look for?
# E E E


## Eficacy

- Results achieved?


## Eficiency

- At what cost?

## Effectiveness

- Final target reached?

# What evaluatoins look for?
# E E E?


## Eficacy

- Results achieved?


## Eficiency

- At what cost?

## Effectiveness

- Final target reached?

Effectiveness of instruments or of the Rationale?

# What is missing?

- Simple things may help
  - Start with sound (and well explained) theory of change
  - Deploy necessary factors interfering in policy implementation success
  - Adopt simple tools like logical frameworks to monitor
  - Review sistematically
  - But...

# Be careful...

- Once you establish an incentive, people will get accostumed
- Environment will change and accostumed people use to be resilient

# Some macrodata about the BR environment for innovation

# Persistent macro indicators (for decades)

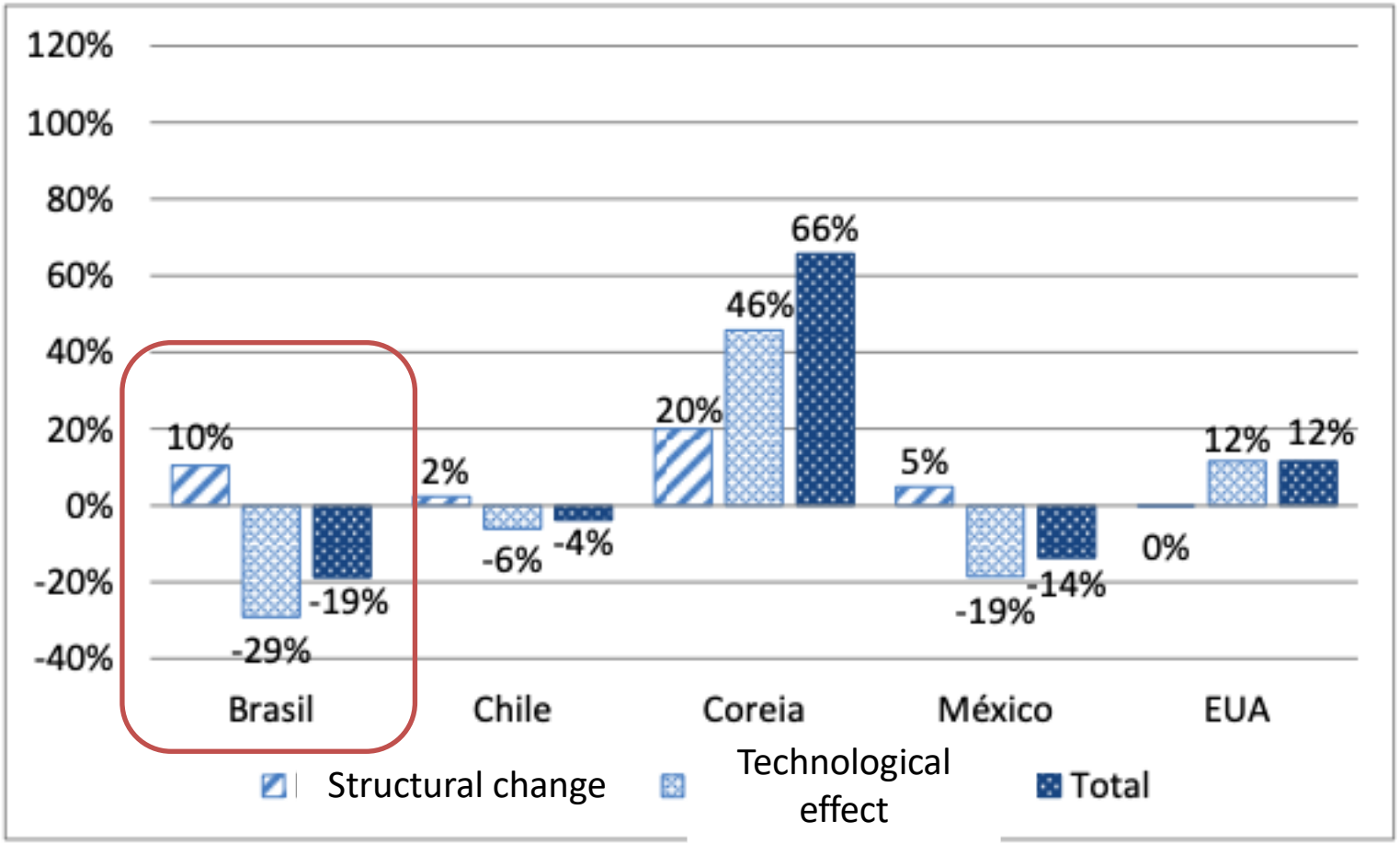
Productivity is stagnated or even declining

Very low degree of openness of the economy

Very low rates of investment

And a wide array of STI policy instruments...

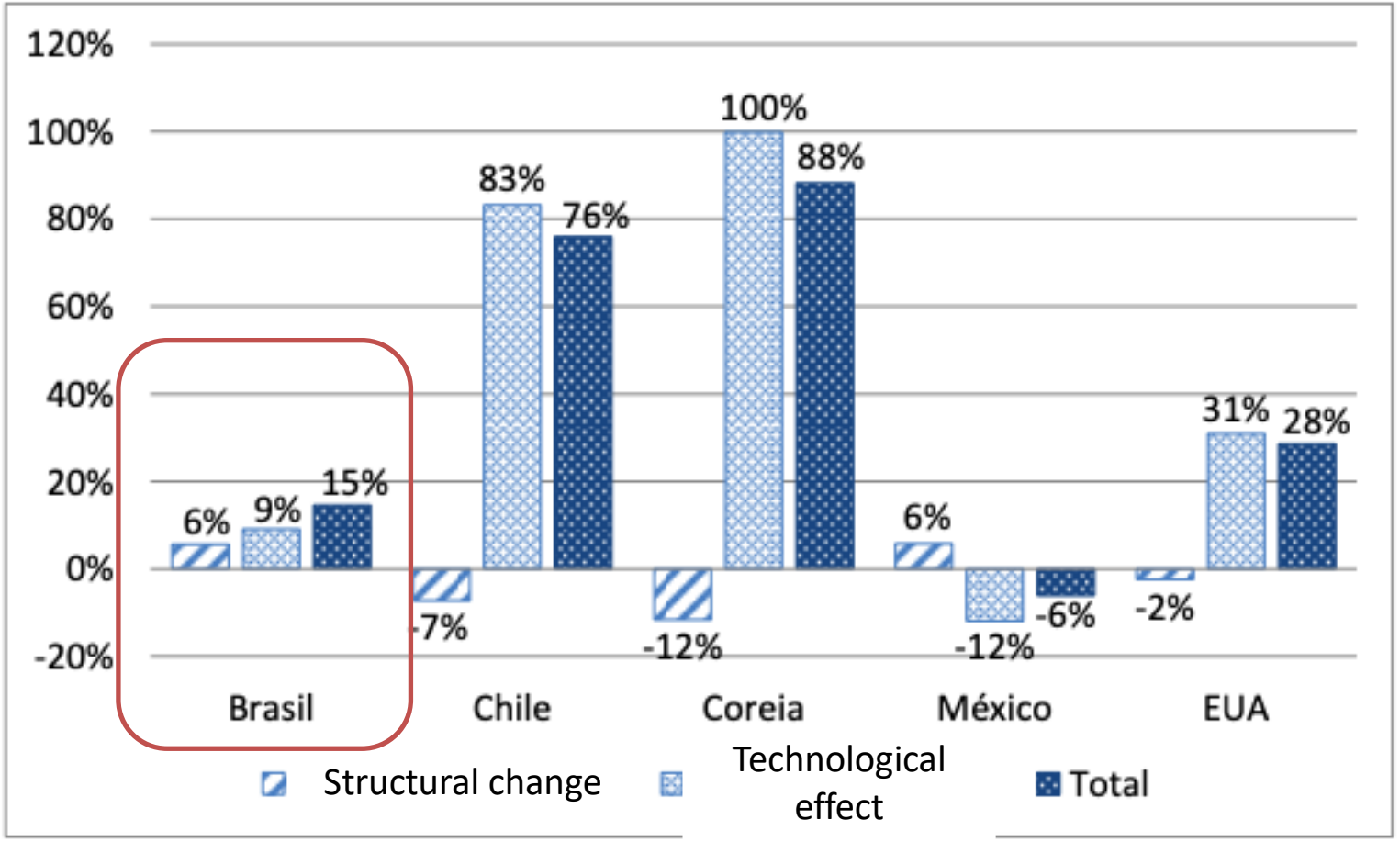
# Productivity 5 countries 1980-1990




Fonte: Groningen Growth and Development Center

Source: Silva, Menezes Filho, Komatsu (2016)

# Productivity 5 countries 1990-2010

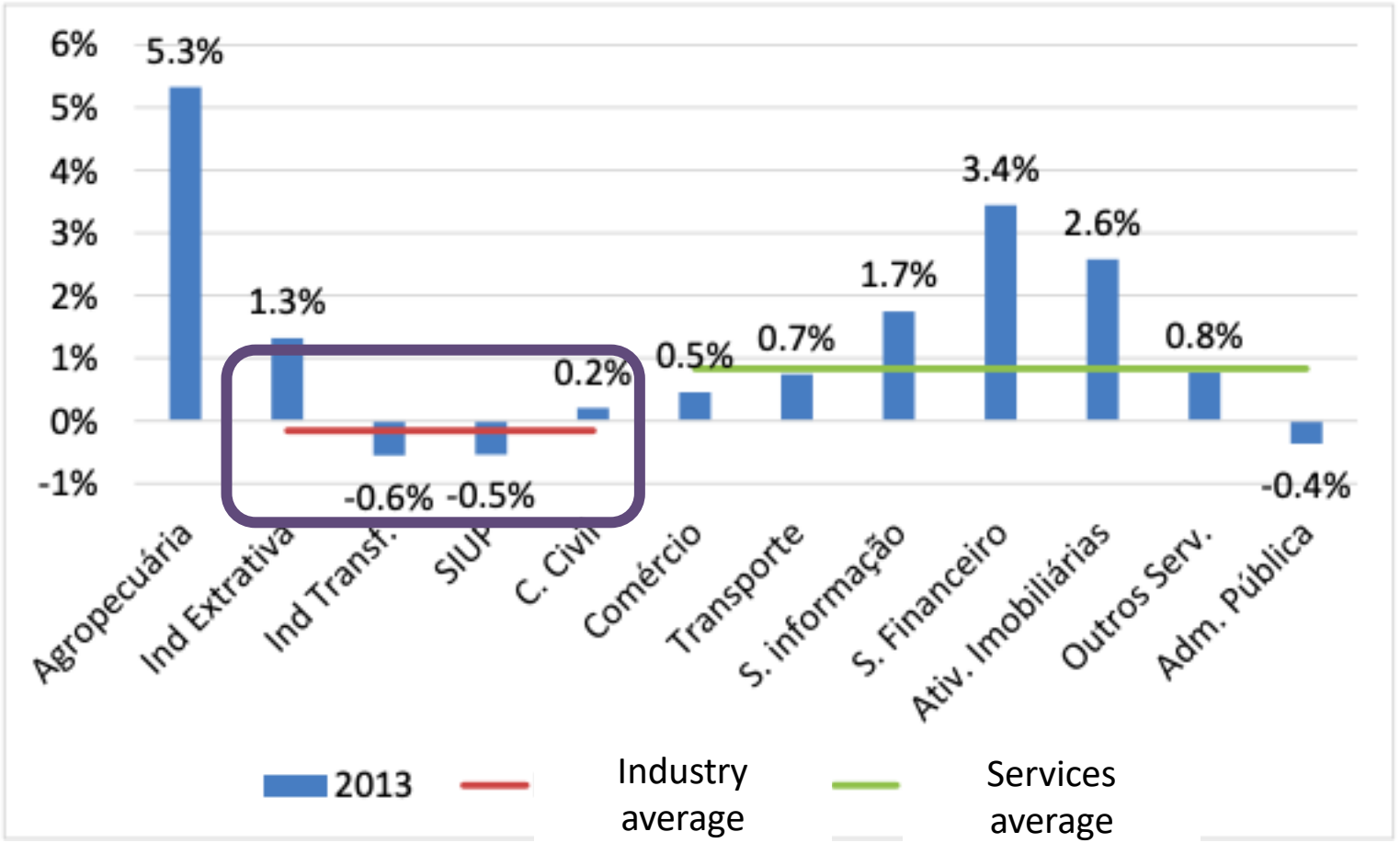



Fonte: Groningen Growth and Development Center

Source: Silva, Menezes Filho, Komatsu (2016)

# Average Productivity Brazil by sector

**Figura 12: Variação Anual Média da Produtividade por Setor – 2000-2013**

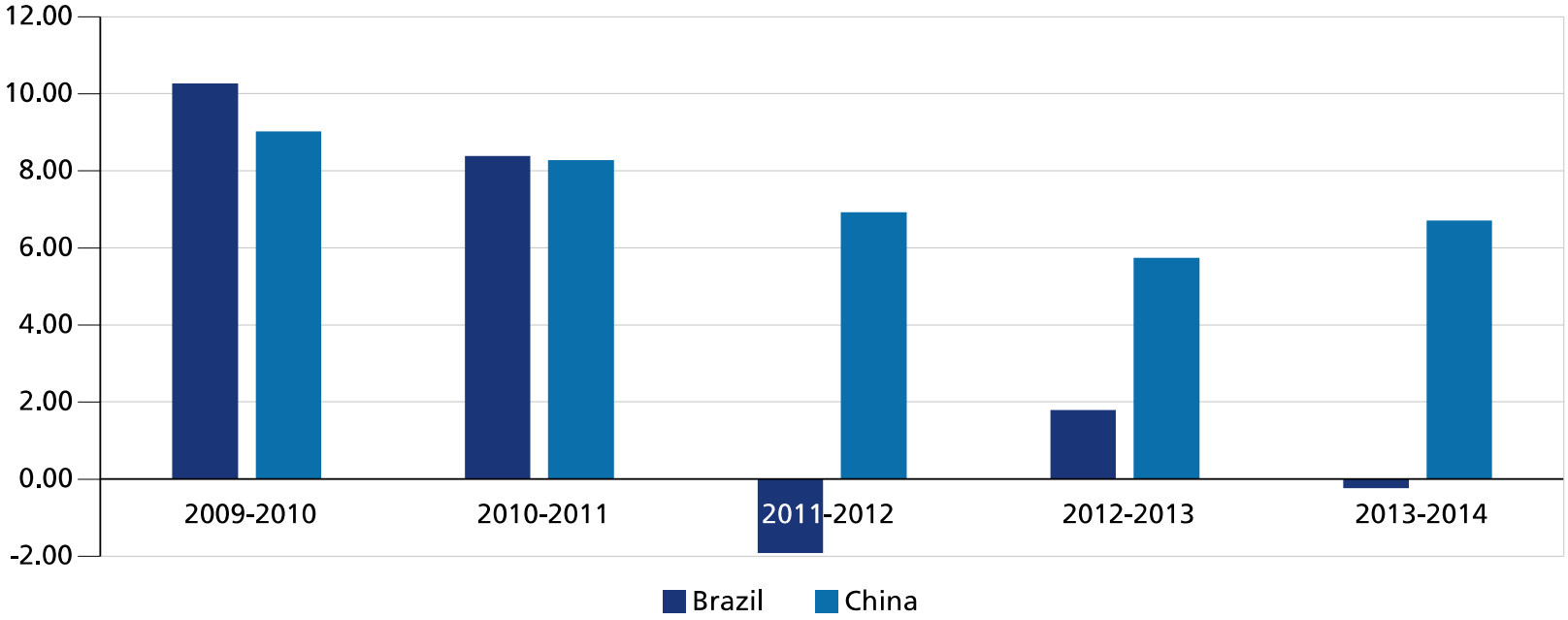



Source: Silva, Menezes Filho, Komatsu (2016)

FIGURE 10

**Labor productivity annual growth, Brazil and China (2009-2014)**

(Percentage of GDP)

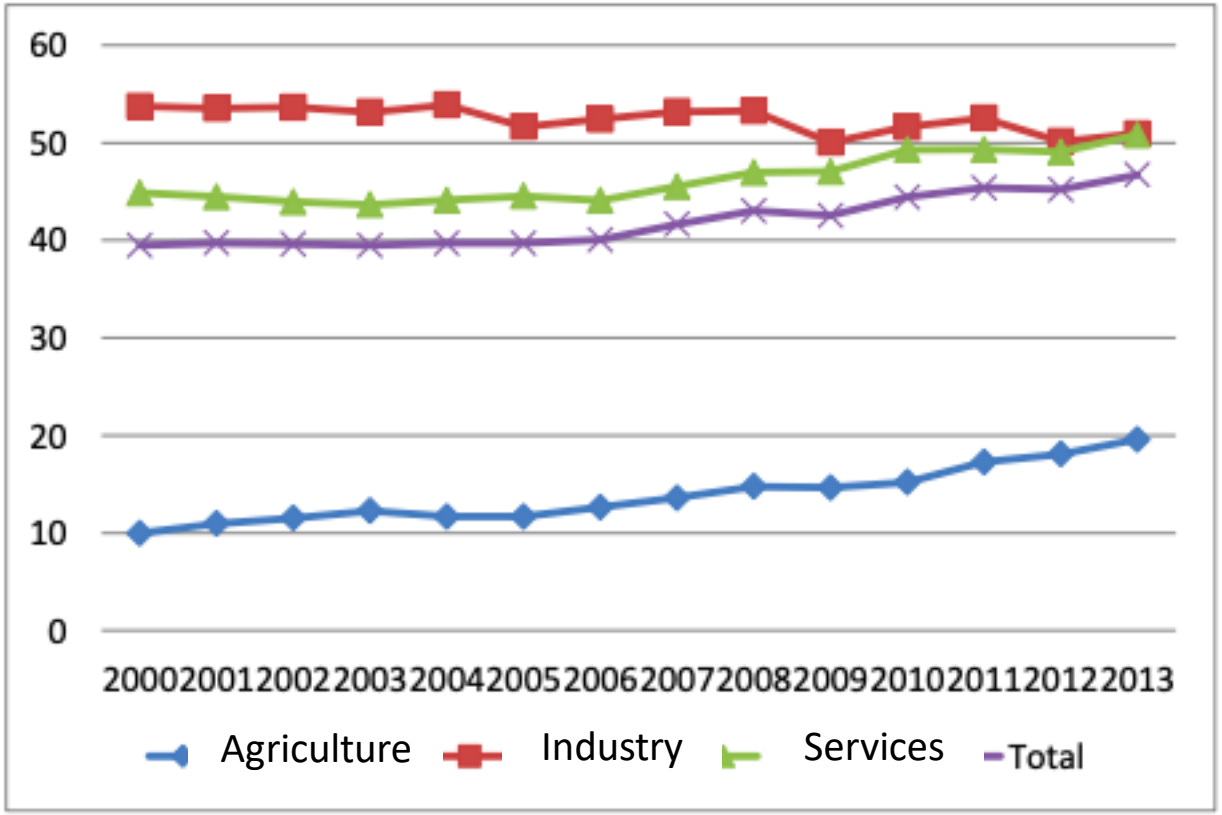



Source: University of Groningen.
Number of persons engaged and output-side real GDP at chained PPPs (2011US$).

Source: De Negri and Rauen (2016)

# Labor productivity by macro sector

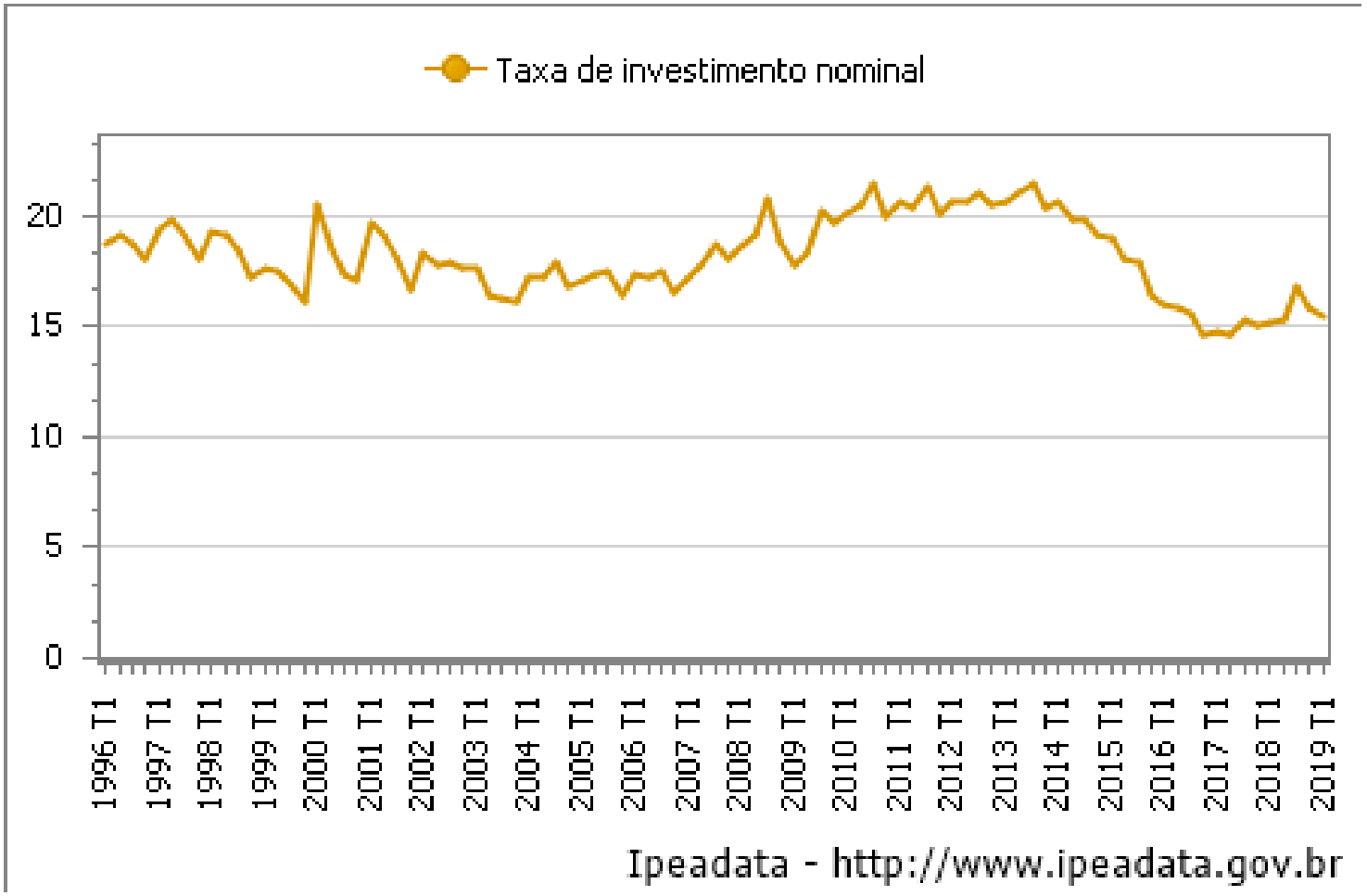
**Figura 9: Produtividade do trabalho por macrossetor (em milhares de reais)**



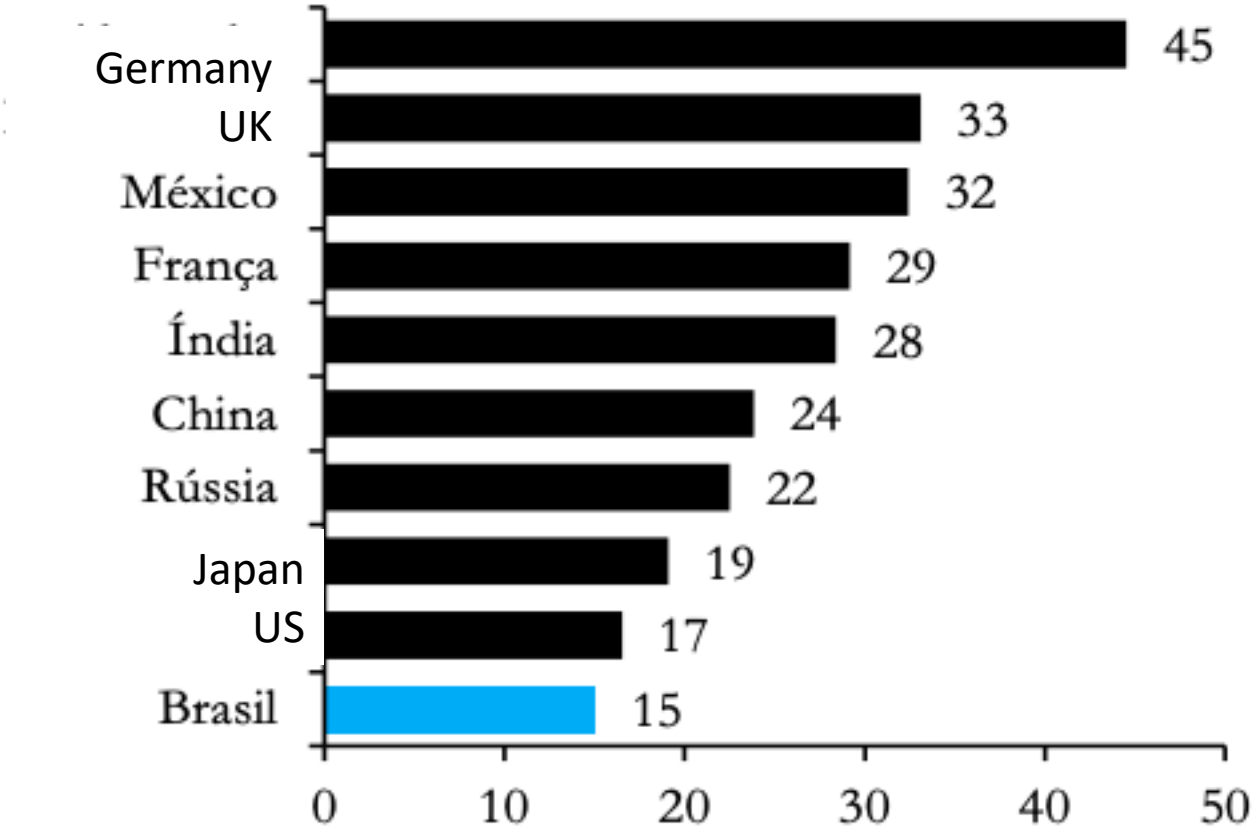

**Fonte: Sistema de Contas Nacionais/IBGE. Elaboração própria.**

Source: Silva, Menezes Filho, Komatsu (2016)

# Investment rate



# Degree of Openness (I+E/GDP)

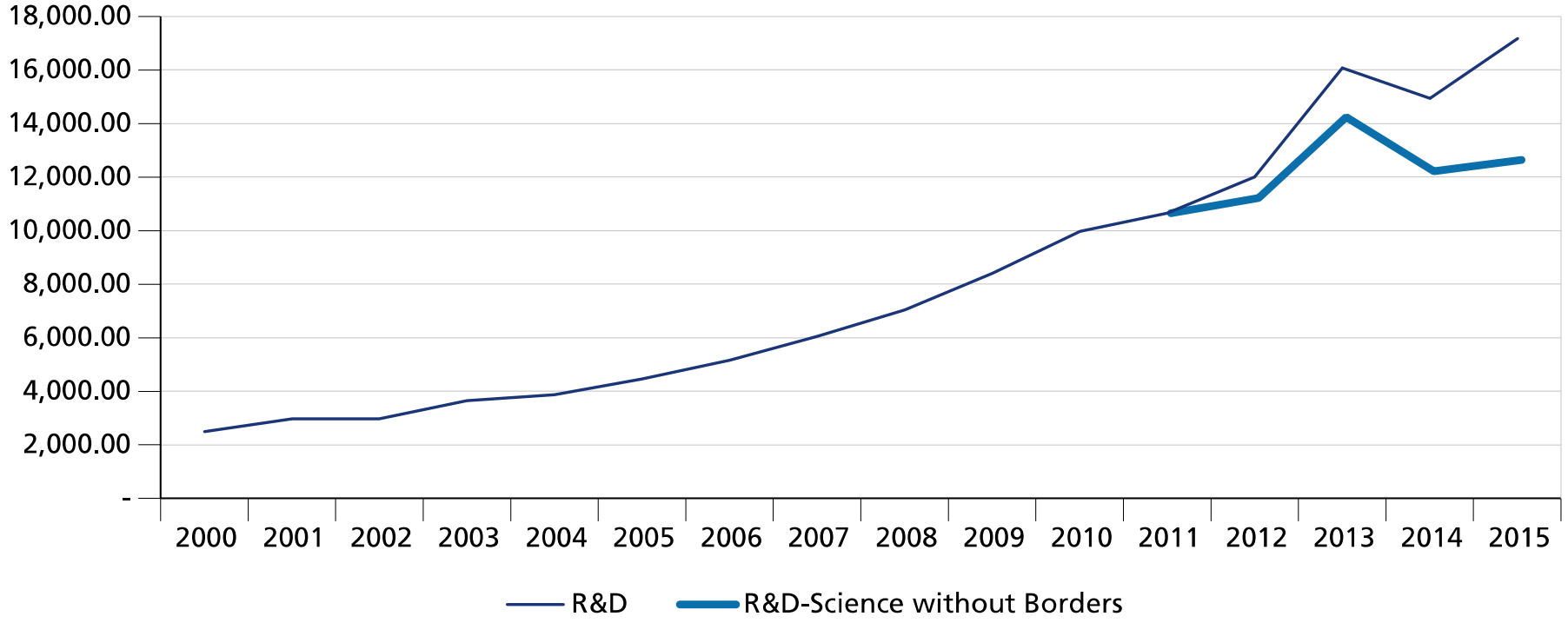



Canuto et al. (2015)

FIGURE 6

**R&D expenditures (excluding graduation studies investments) and R&D expenditures (excluding graduation studies investments) without CsF. Brazil (2000-2015)**

(R$ billion)




Source: De Negri and Rauen (2016)

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## Main ST&I policies and instruments in Brazil (2015)

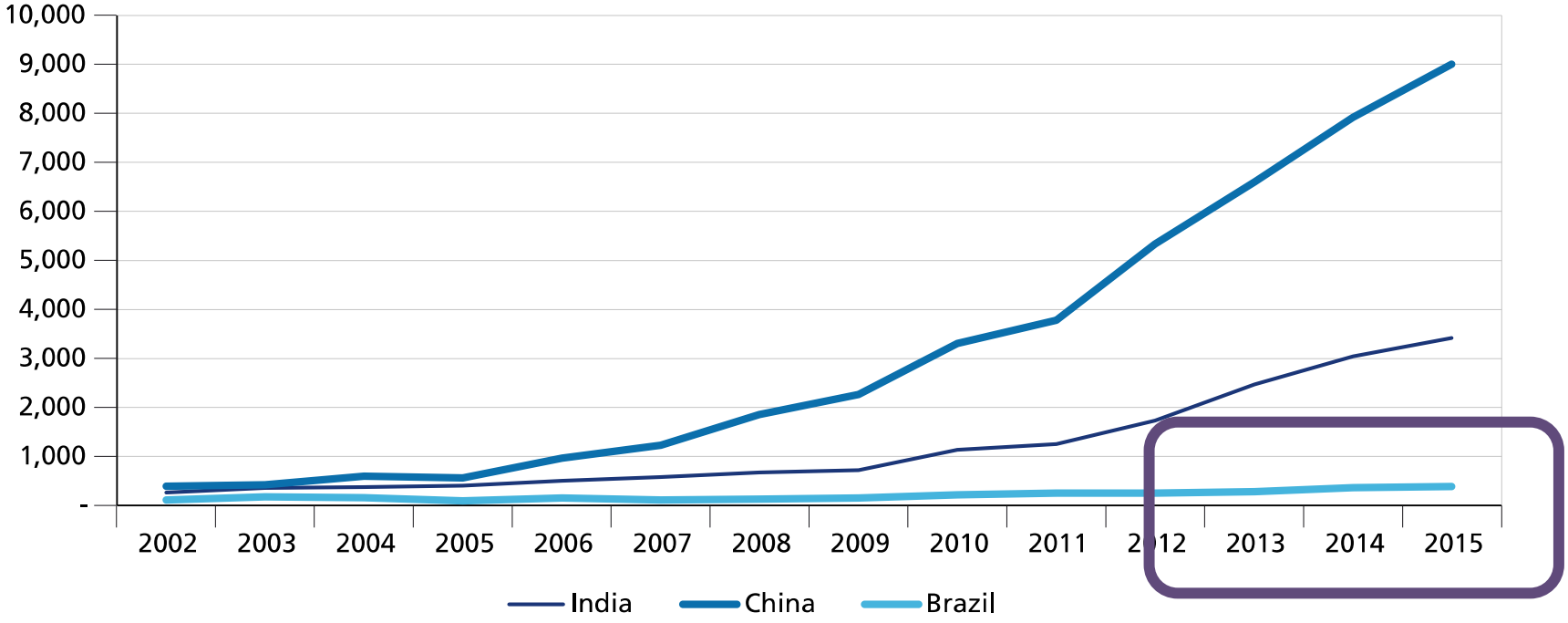
| Innovation and S&T policies and instruments (main sources of funding for S&T in Brazil) | | Current Reais | US$ ppp |
|---|---|---|---|
| Tax breaks[1] | Informatics Law (Laws nº 8.248/1991, nº 10.176/2001 and nº 11.077/04) | 5,022,390,000 | 2,716,273,661 |
| | Business RD&I expenditures (Law nº 11,196/2005) | 1,835,212,176 | 992,543,091 |
| | Business S&T expenditures (Law nº 4.506/64 and Decree no 756/69) | 1,323,754,218 | 715,929,810 |
| | RD&I in automotive sector (Law nº 12.715/12, Decree nº 7.819/12 and Law nº 12,407/11) | 2,850,284,180 | 1,541,527,409 |
| | Other tax breaks[2] | 877,032,545 | 474,328,039 |
| | **Total (tax breaks)** | **11,908,673,120** | **6,440,602,011** |
| Subsidized credit for innovation | Disbursements by FINEP | 2,603,000,000 | 1,407,787,994 |
| | Disbursements by BNDES[3] | 4,501,000,000 | 2,434,288,805 |
| | **Total** | **7,104,000,000** | **3,842,076,798** |
| S&T public investment (excluding graduate studies expenditures)[4] | Federal investments | 22,809,042,668 | 12,335,880,296 |
| | State investments | 8,974,188,001 | 4,853,535,966 |
| | **Total** | **32,783,230,671** | **17,189,416,262** |
| Counterpart in R&D by companies in regulated sectors (private compulsory investment) | Electricity Regulatory Agency (ANEEL) R&D program[5] | 392,460,000 | 212,255,273 |
| | The National Petroleum Agency (ANP) R&D program | 1,030,956,397 | 557,575,120 |
| | **Total** | **1,423,416,397** | **769,830,393** |

Source: De Negri and Rauen (2016)

Total: US$ 28 Billion in 2015

FIGURE 9

**Patent grants at USPTO, selected countries (2002-2015)**




Fonte: USPTO.

Source: De Negri and Rauen (2016)

# Which policies can be implemented for catching up under:

- Persistent low rates of investment?
- Persistent (very) low degree of openness and high level of barriers?
- Most dynamic sectors turned to internal market?
- Persistent (and decreasing) labor productivity?

# LESSONS FROM EVALUATIONS WE HAVE DONE

# FAPESP's Programs

- PITE University - Company Relationship
- PIPE (SBIR like)
- Scholarships – Under grad; MSc; PhD
- International cooperation
- Young carreer
- Public Policy
- Multiuser equipment

- Several types of collaborations and partnerships

# Other programs from other agencies

- **Fiscal Incentives for ICT sector**
- **EMBRAPII Brazilian Agency for industrial innovation**
  - **Cooperation RO-I for innovation**
- FINEP Brazilian Innovation Agency
  - Subvention and credit for innovation
  - Academic R&D
- National Service for Industrial Training
  - cooperation RO-I for innovation
- Serrapilheira Institute
  - Grants for young career / raising stars
- Foundation for Agricultural Innovation (Chile)
  - Grants for producers and researchers
- INCAGRO (Peru)
  - Grants for producers and researchers

# Let’s see 2 cases

a) top down sectoral policy

Fiscal incentives for R&D in ICT sector

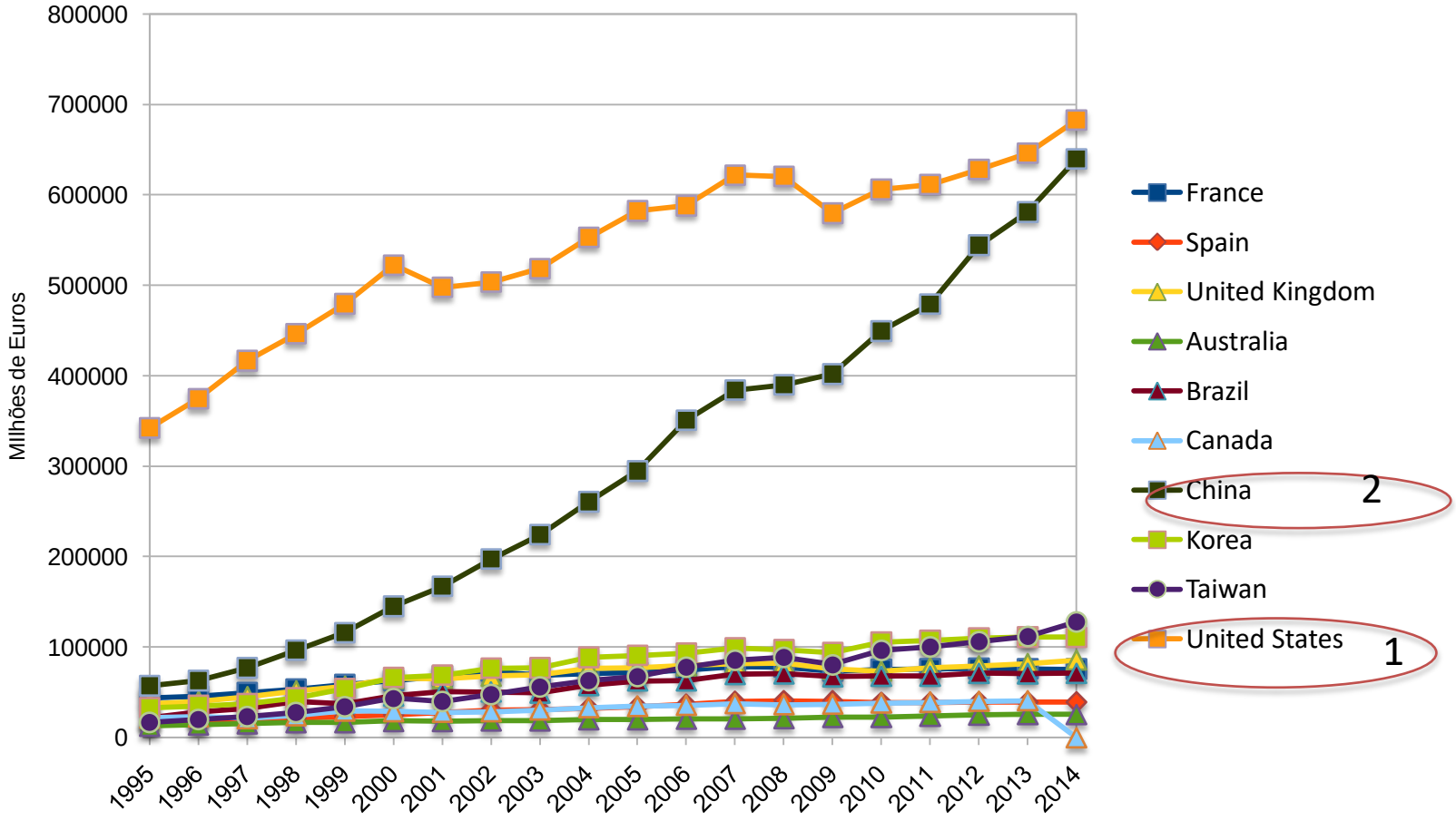
b) bottom up transversal policy

Fostering industry – RO R&D collaboration

# ICT fiscal incentives

- ICT Law (IL) → created in the early 1990s to encourage R&D activities in the ICT sector in the country.
  - More than 25 years; now about to change
  - Relevance:
    - BRL$ 12 billion (circa 4 US billion) in R&D activities from 2006 to 2015 (R$1,5 bi/year)
    - Turnover of recipient companies: more than BRL$ 300 billion (same period)
    - Tax relief: R$ 5.6 bi/year

# Added Values ICT selected countries



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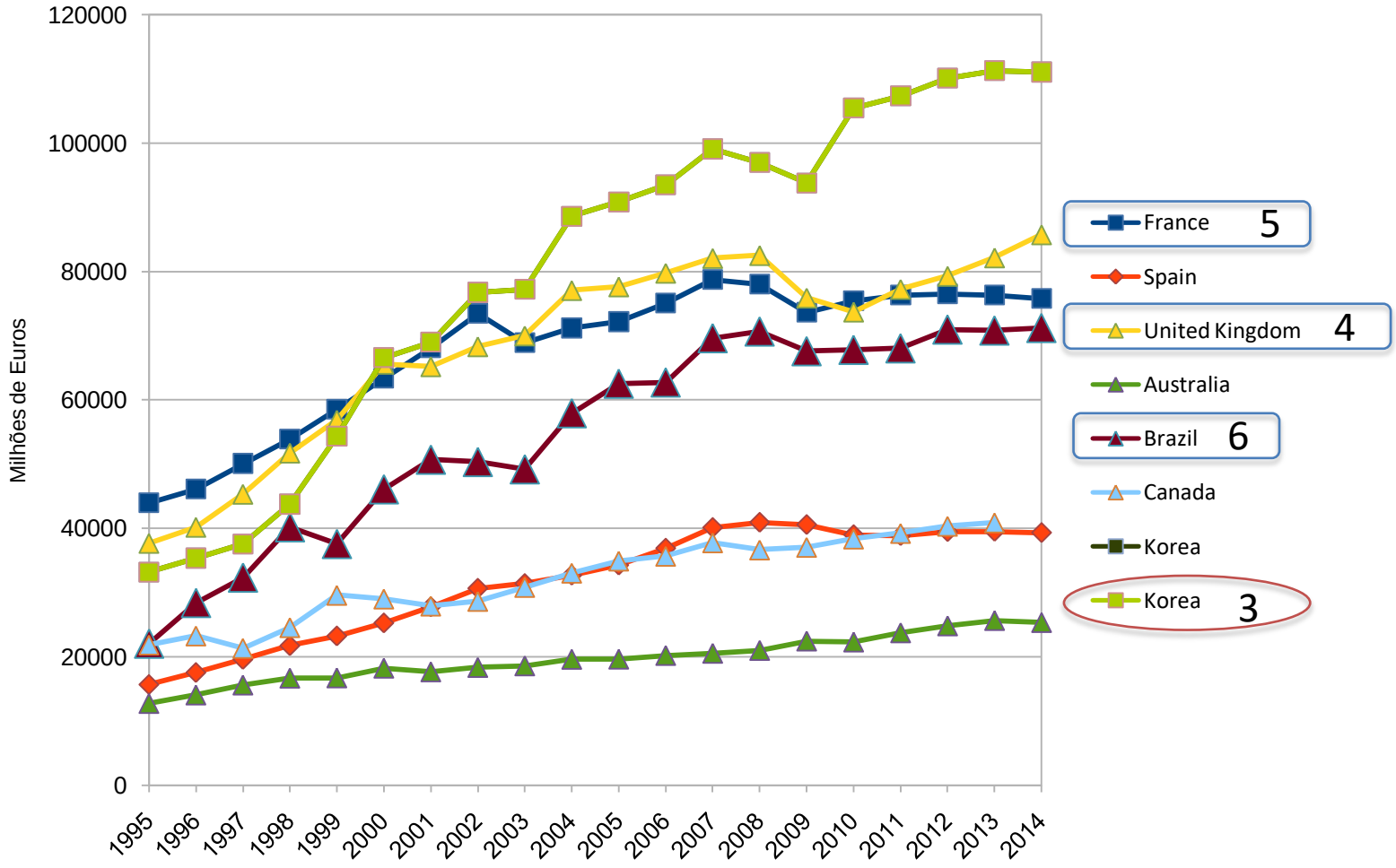
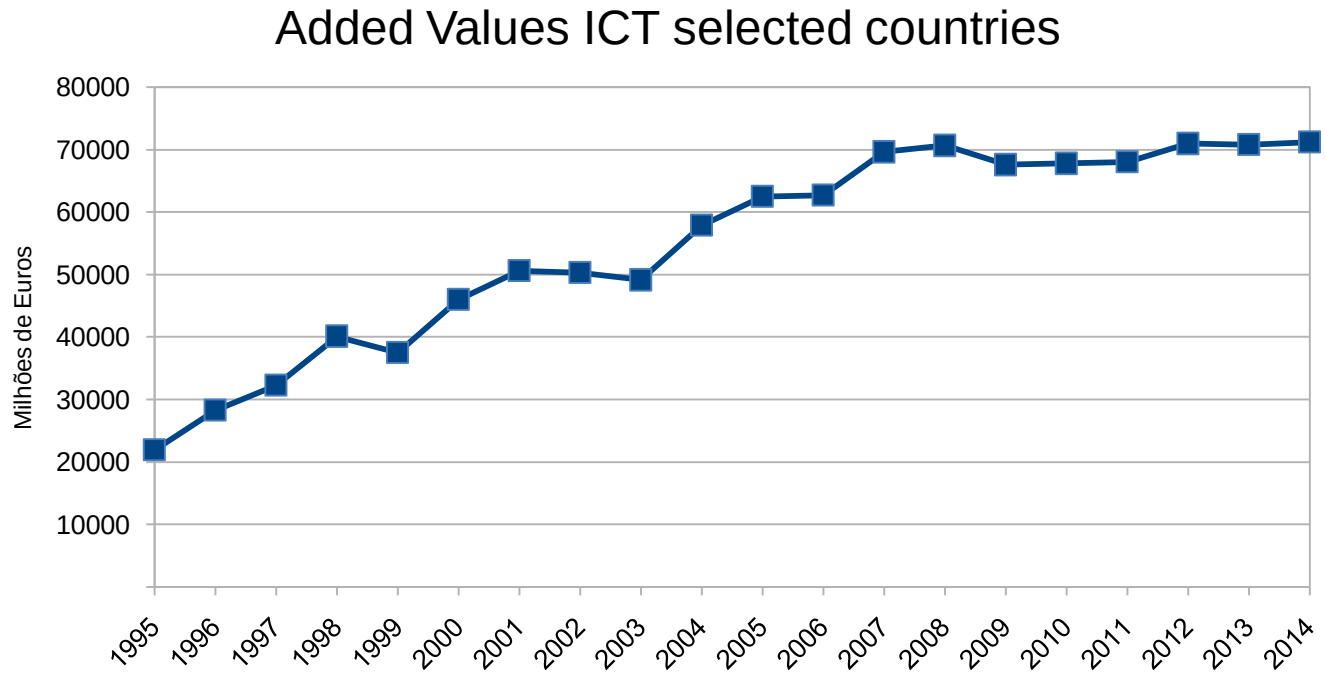



*Excluindo-se EUA e China


Added Values ICT selected countries
Milhões de Euros
80000
70000
60000
50000
40000
30000
20000
10000
1995
1996
1997
1998
1999
2000
2001
2002
2003
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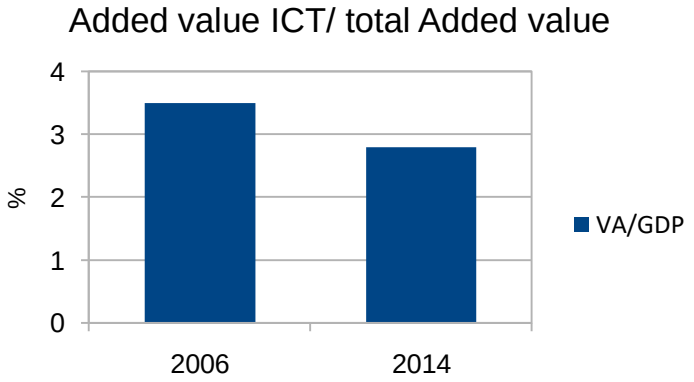
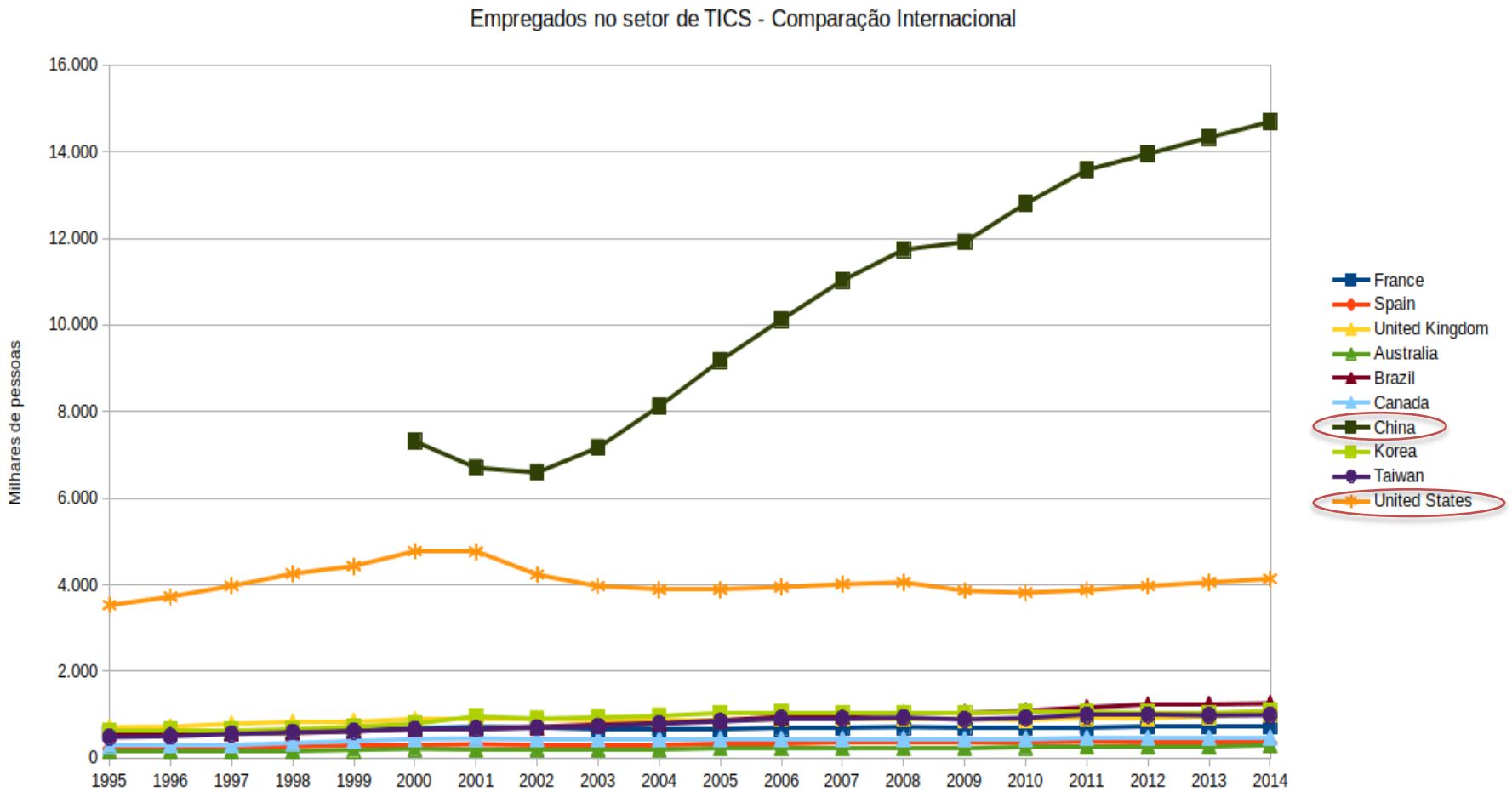
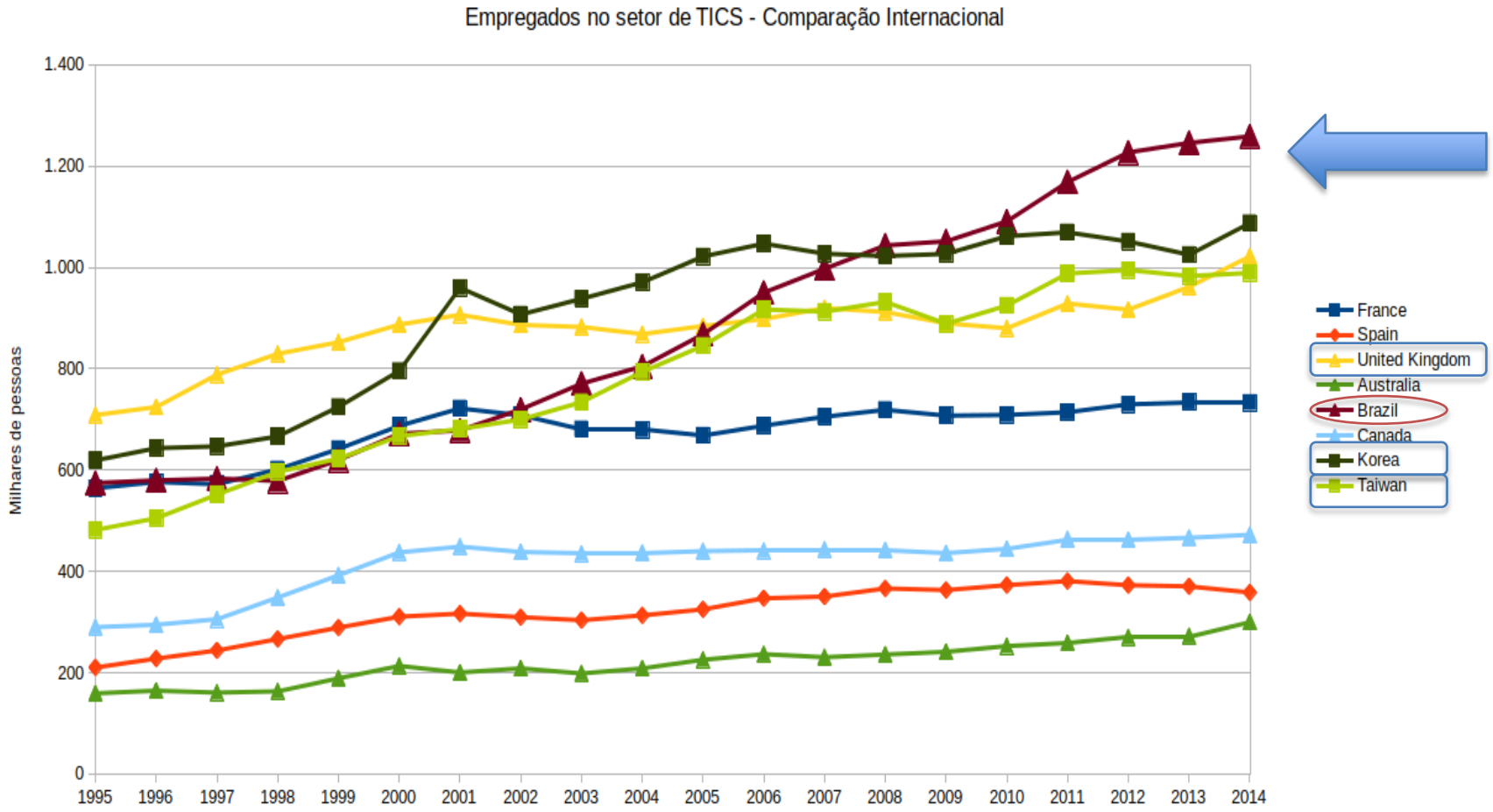
2011
2012
2013
2014


Added value ICT/ total Added value
%
4
3
2
1
0
2006
2014
VA/GDP

# Employment ICT sector selected countries

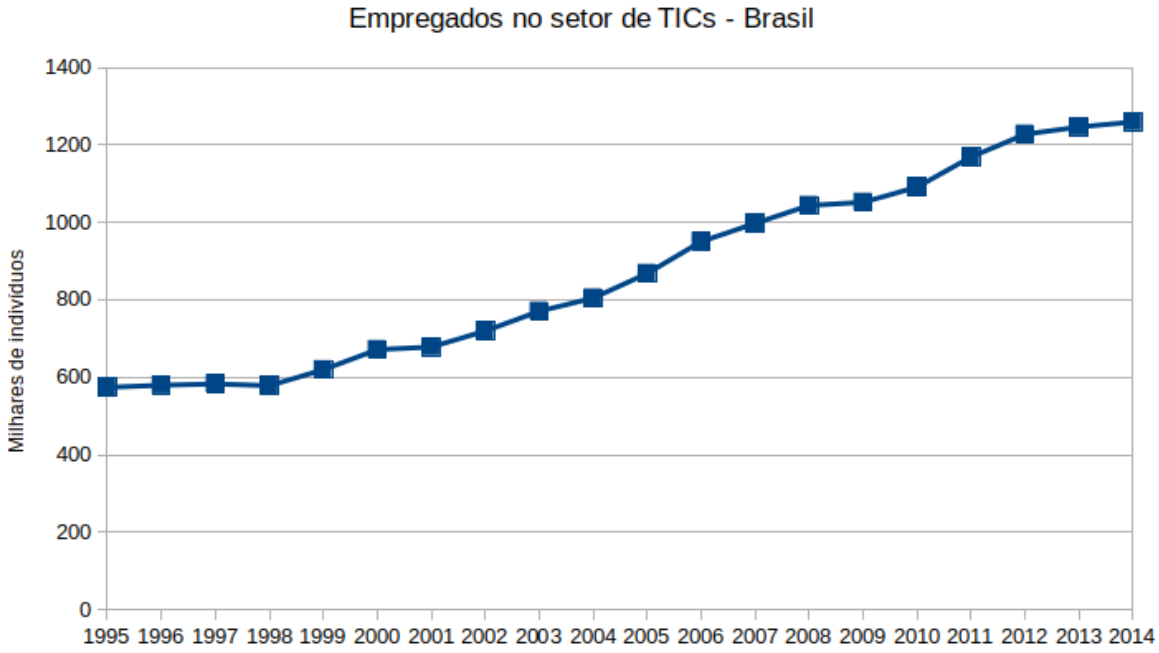


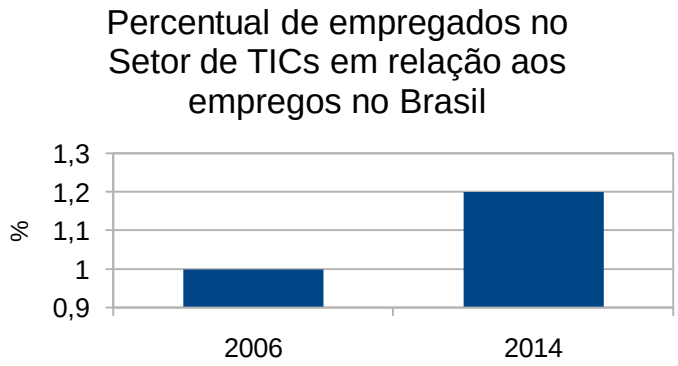
# Employment ICT sector selected countries



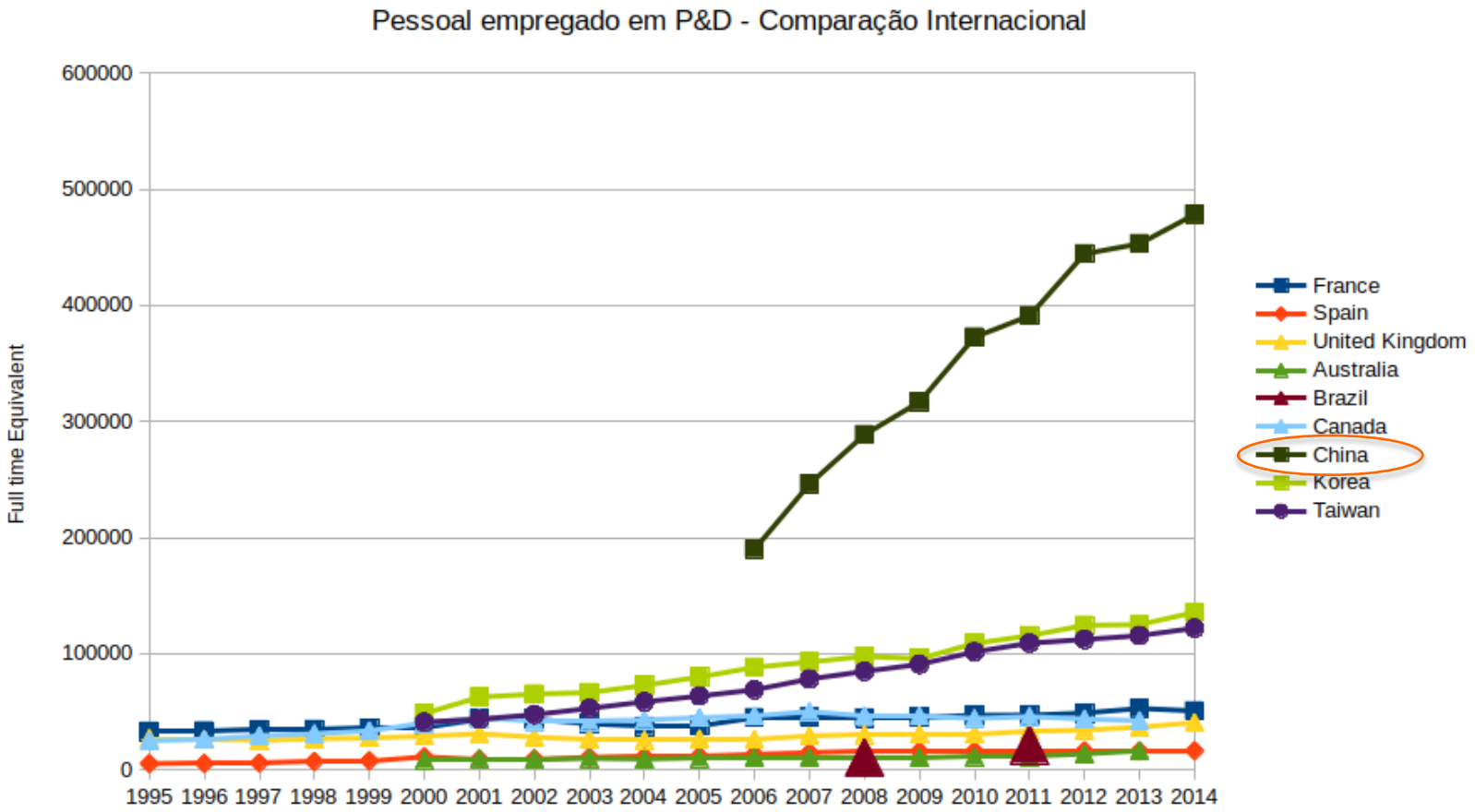

Exclude US and China

# Employment ICT Brasil

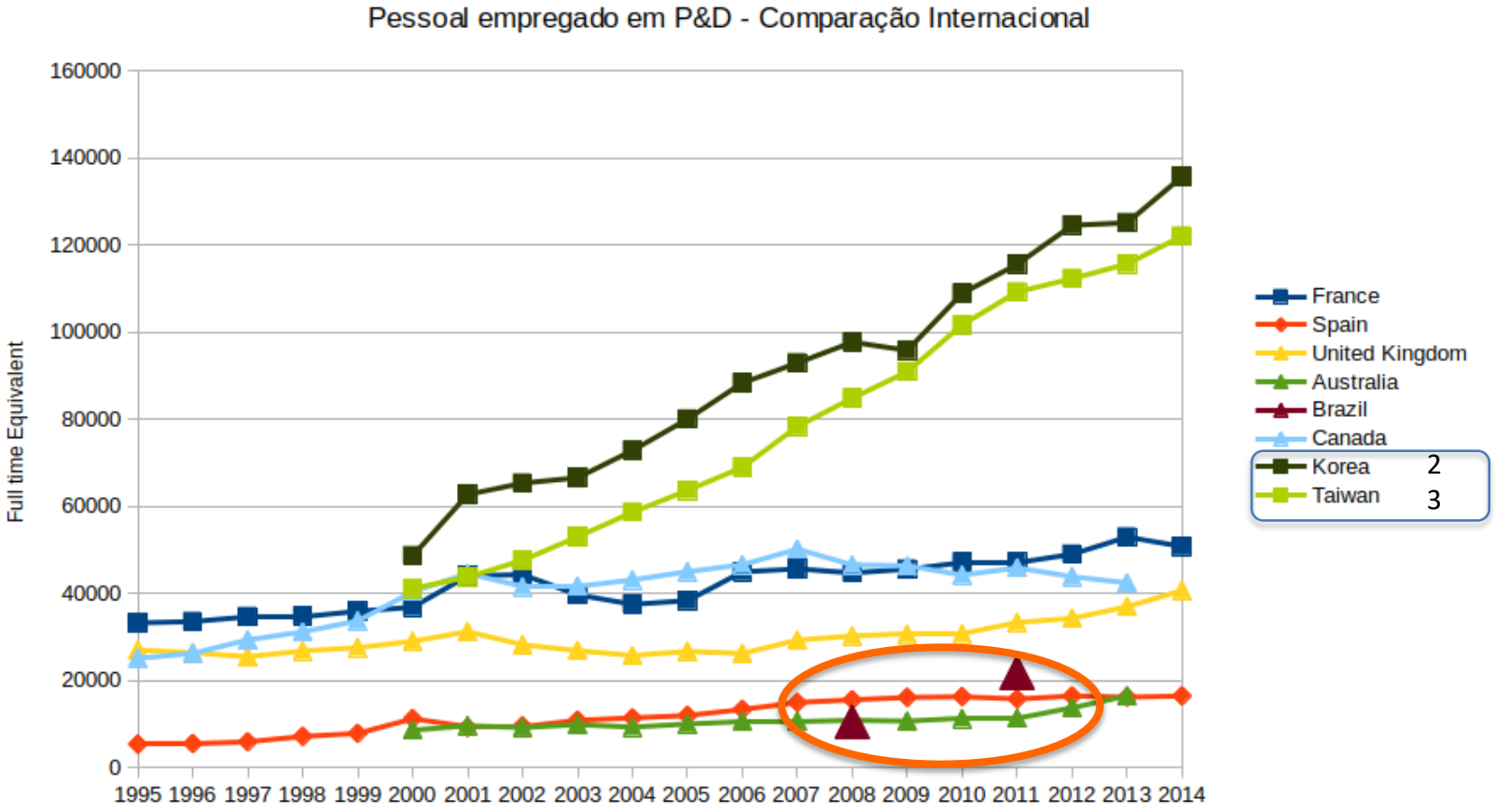


# PERD in the ICT sector



# PERD in the ICT sector

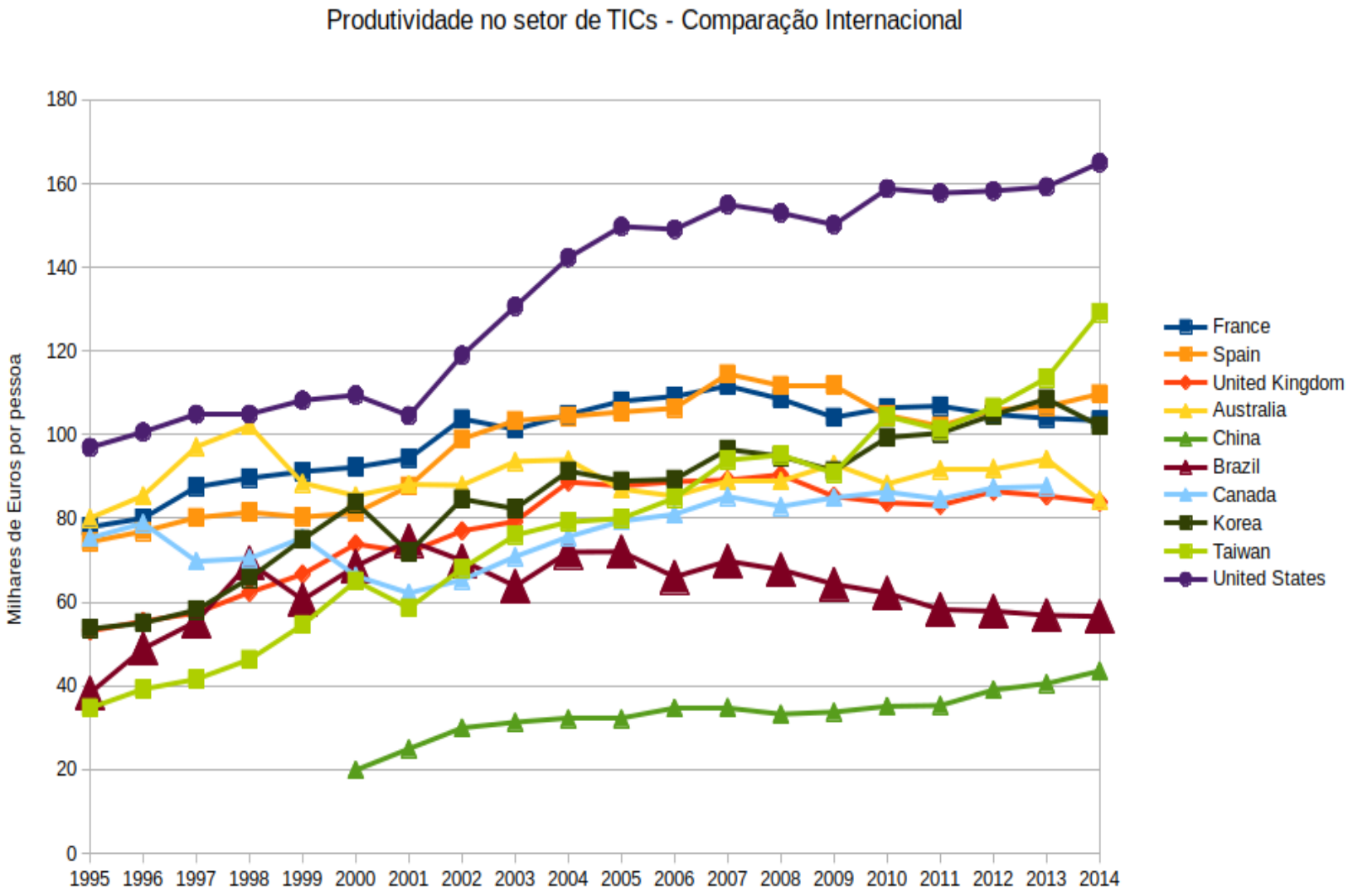



*exclude US and China

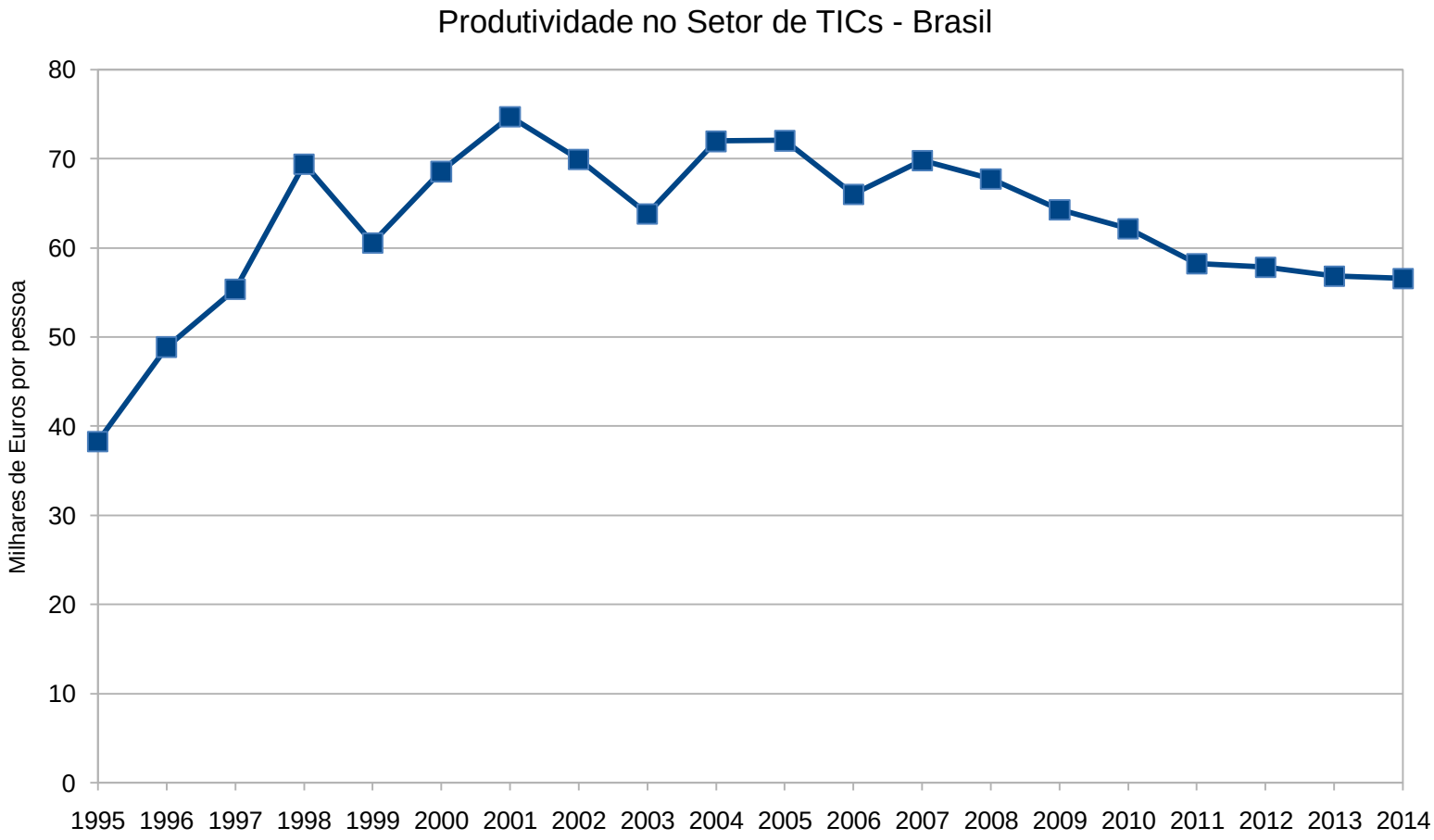
# Added value and employment ICT sector (2005-2014)

- Brasil:
  - Growth of employment 1,64 x
  - Growth of added value1,4 x
- EUA:
  - Growth of employment circa zero
  - Growth of added value 1,4 x
- China:
  - employment 2x
  - Added value 3x

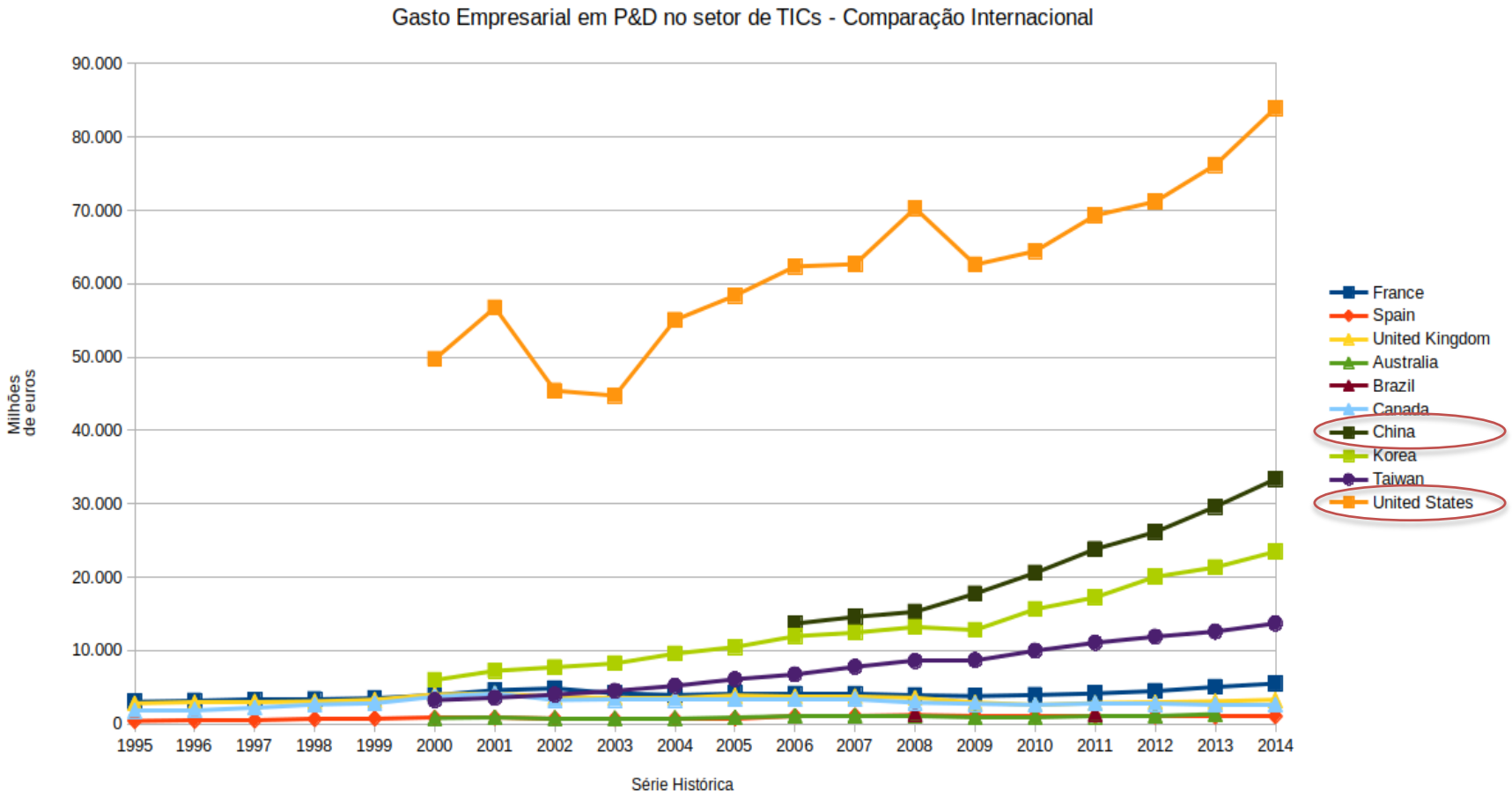
# Productivity ICT sector selected countries



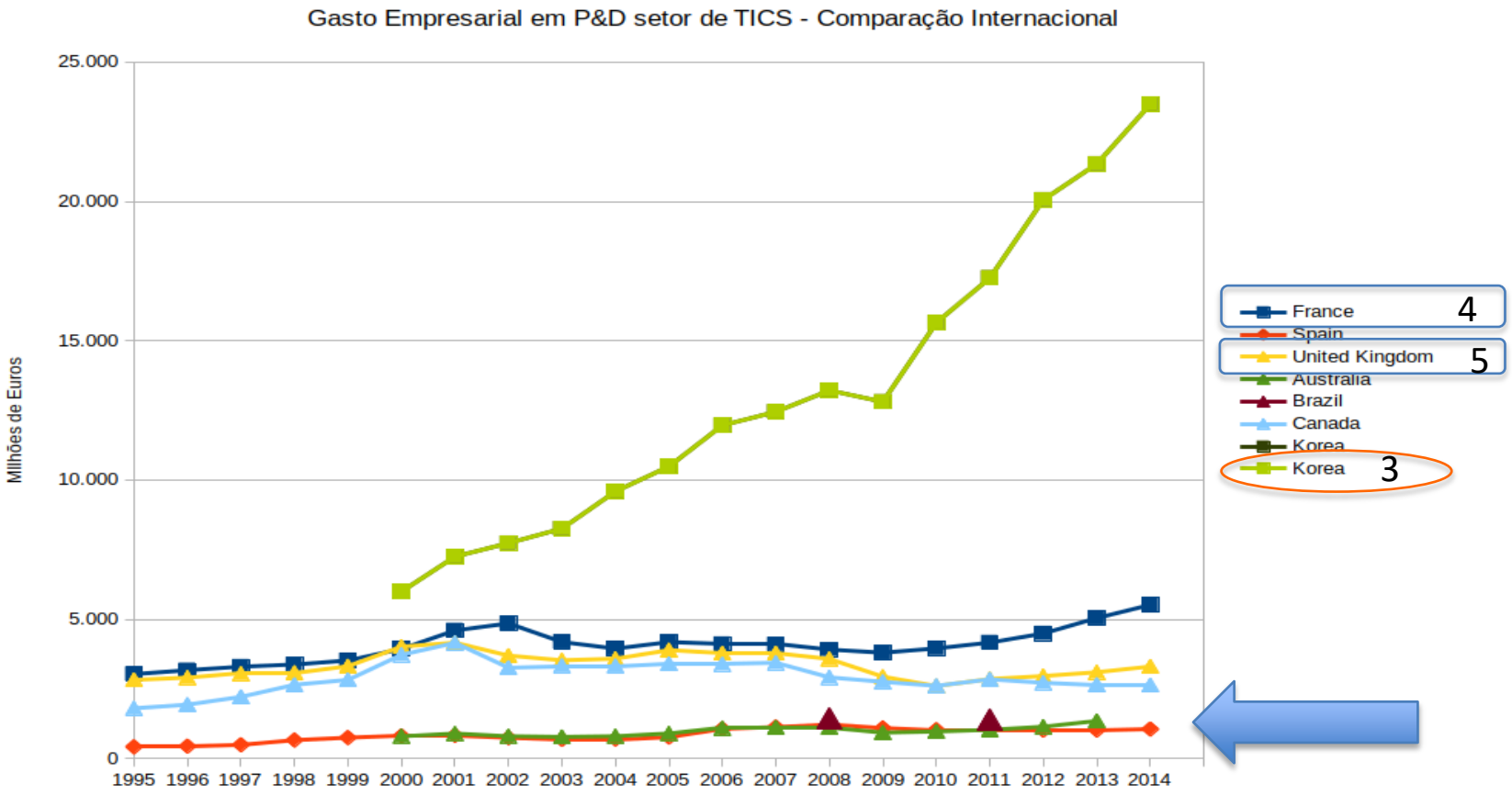
# Productivity ICT sector in Brazil



# BERD in ICT in selected economies

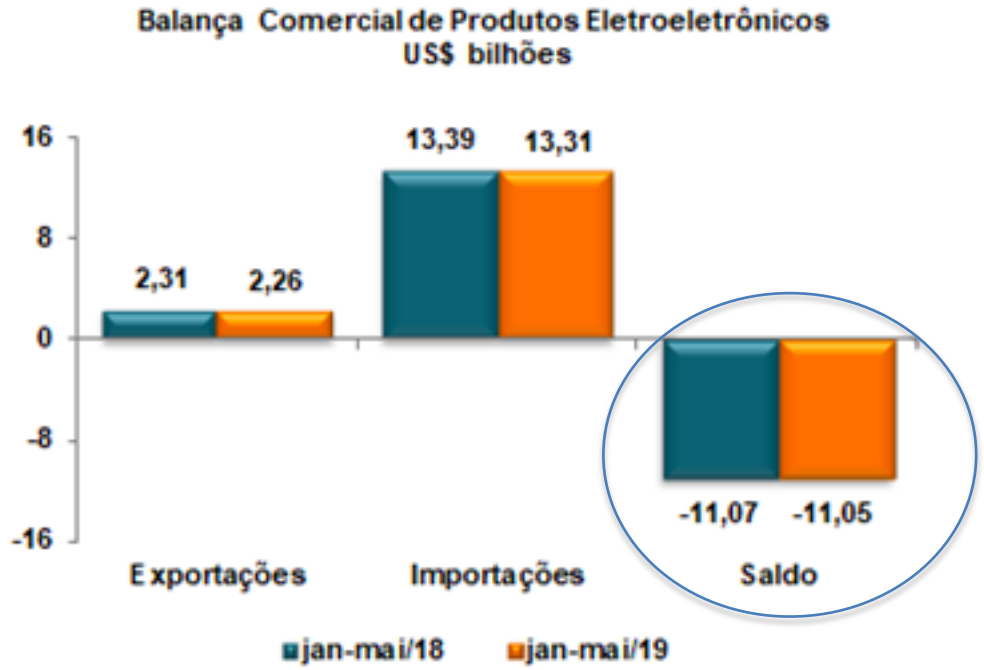


# BERD in ICT in selected countries




*Exclude US and China

# Trade balance of ICT sector in Brazil




- Deficit : US$ 25 billions aprox: 15% of total Brazilian imports

# conclusions

- Increasing fiscal incentives
- Increasing investment in R&D
- Increasing general employment, decreasing R&D employment
- Stagnation of added value
- Decreasing productivity
- Increasing commercial deficit

- How to explain it?

# conclusions

- Typical case of voluntarism of policies
- Increasing R&D cannot be an end in itself
- You may have tech upgrade without any catching up
- Evaluation help us in finding reasons of why following manuals and traditional indicators may stand for .... nothing

# Case 2
# PIPE – Fapesp's Small Business Innovation

# PIPE Themes of evaluation (2007-2017) grantees x rejected

1. Companies and project profiles
2. Entrepreneur/Researcher profile
3. R&D Investment

4. Financial and Economic data (internal and external market + venture)
5. Employment and job creation (total and R&D)
6. Intelectual property and tec. transfer

7. Governance and management
8. Parnership and collaboration

# Traditional Hypotheses

H1 input: Companies increase their capacity on technological innovation

H2 output: PIPE promotes socio-economic impacts measured by income, exports and employment and job creation

H3 behaviour: PIPE promotes culture of technological innovation in small business

# Non Traditional Hypotheses

H4: Organizational and managerial variables influence outputs and take advantages from ecosystems

H5: social capital is a critical capability for SBIR like awardees

# PIPE case
# Quasi-experimental approach

| Group of Awardees (2003-2017) | Group of Rejected (2003-2017) |
| --- | --- |
| • 400 population of concluded projects<br>• 185 respondents (46%) | • Circa 2000 projects<br>• 492 respondents (25%) |

# SOME FINDINGS FOR PARTENERSHIP, GOVERNANCE AND MANAGEMENT

# Input x output

| Input | output |
| --- | --- |
| Incubation | Successful technological results |
| Spin-off | Innovation |
| Coordinator's background | R&D investment |
| Explicit R&D&I strategy | Employment higher education |
| Governance and Compliance | Employment in R&D |
| R&D Project Management | Net Income (variation) |
| Parnership with ROs | Parnership with ROs |
| Parnership others | Parnership others |

# Bivariate analysis: inputs x outputs

| | succesful technological results | Innovation | R&D investment (variation) | Employment higher education | Employment in R&D (variation | Net Income (variation) | Parnership with ROs | Parnership others |
|---|---|---|---|---|---|---|---|---|
| Incubation | P/NS | NO | P/NS | P/S | NO | P/NS | P/NS | P/NS |
| Spin-off | N/NS | N/NS | P/NS | P/NS | NO | N/NS | P/NS | N/NS |
| Coordinator's background | P/NS | NO | N/S | N/S | N/S | NO | NO | NO |
| Explicit R&D&I strategy | P/NS | P/NS | NO | NO | NO | NO | P/S | P/S |
| Governance and Compliance | P/S | P/NS | NO | P/S | P/S | NO | P/NS | P/S |
| R&D Project Management formalized | P/S | P/S | NO | P/S | P/S | N/NS | P/S | P/S |
| Parnership with ROs | P/S | NO | NO | NO | NO | NO | | |
| Parnership others | P/NS | P/S | NO | NO | NO | NO | | |

Legend:
P/NS: POSITIVE/NON-SIGNIFICANT
N/NS: NON POSITIVE/NON-SGNIFICANT
P/S: POSITIVE/SIGNIFICANT
NO: NO CORRELATION

# Bivariate analysis: inputs x outputs

| Most influent variables (predictor) | Mutual causality |
| --- | --- |
| • R&D Project Management capabilities<br>• Compliance formalized | • Partnership and governance and<br>• professional R&D Management |

# Some results

Non significant R&D expenditures between awardees and rejected

Companies with management and governance skills increased expenditures more than non-skilled

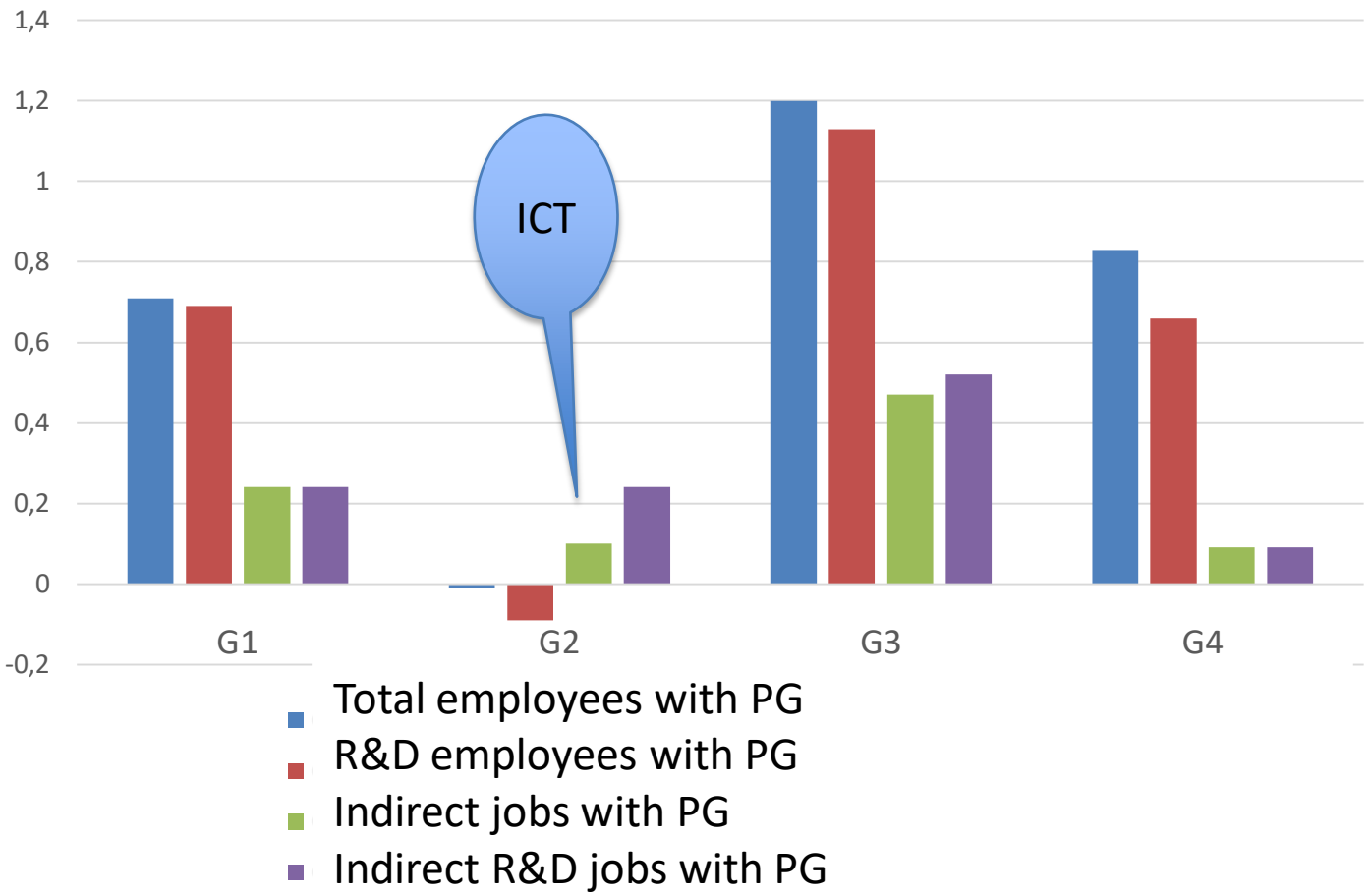
Job creation: positive effect of around 60% in total job creation.

Job creation in R&D positive and significant before (2x) and after (3x)

Companies with management skills increase job creation in R&D by 3 x

ICT sector no difference for job creation and

# Evolution of Job creation
# Before / after



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# Conclusions

- Bottom level policy
- Easier to manage and tuned
- Effectiveness well defined
- But not possible to talk over catching up...

# CHALLENGES

# Back to theory of change (but well detailed)

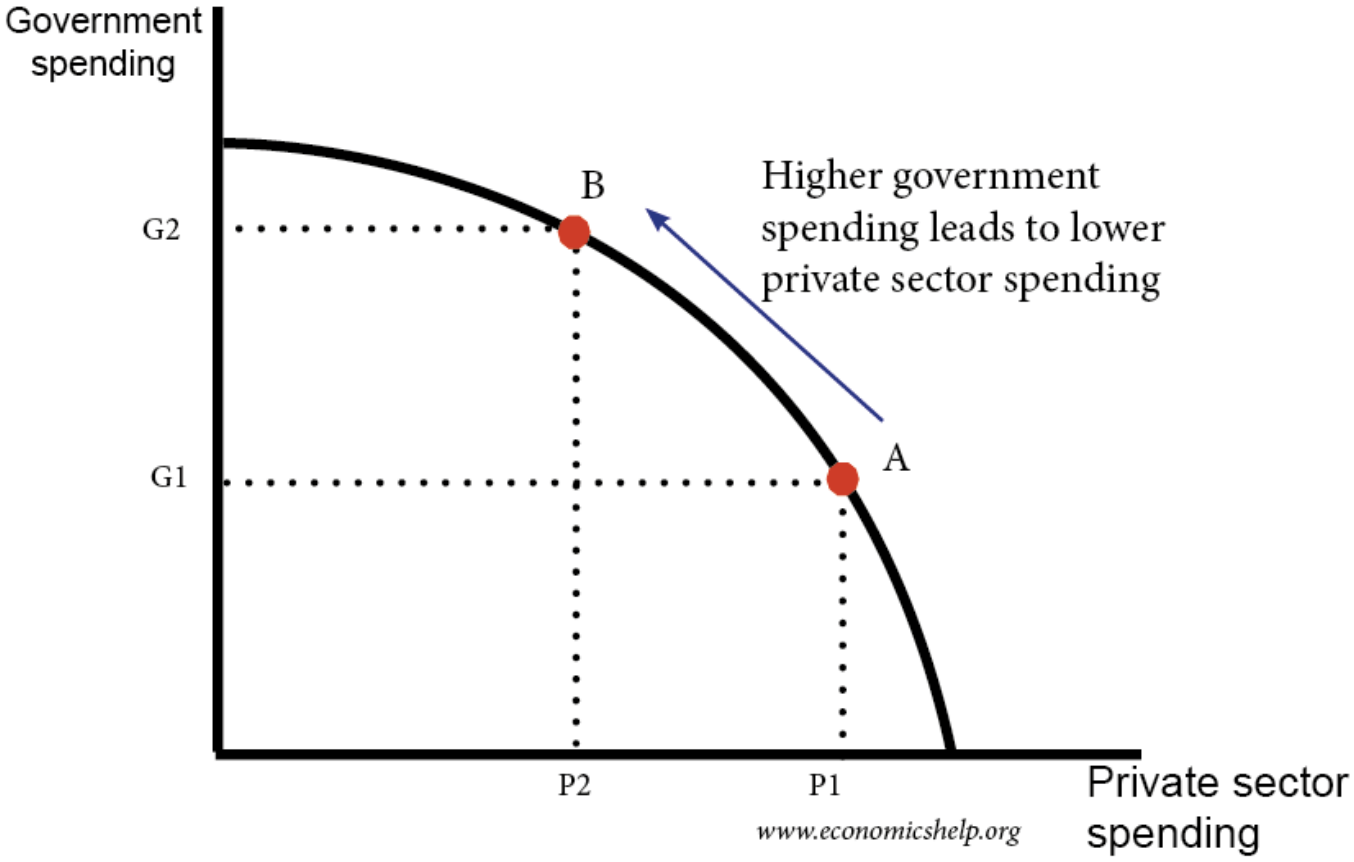



Fonte: https://www.theoryofchange.org/what-is-theory-of-change/

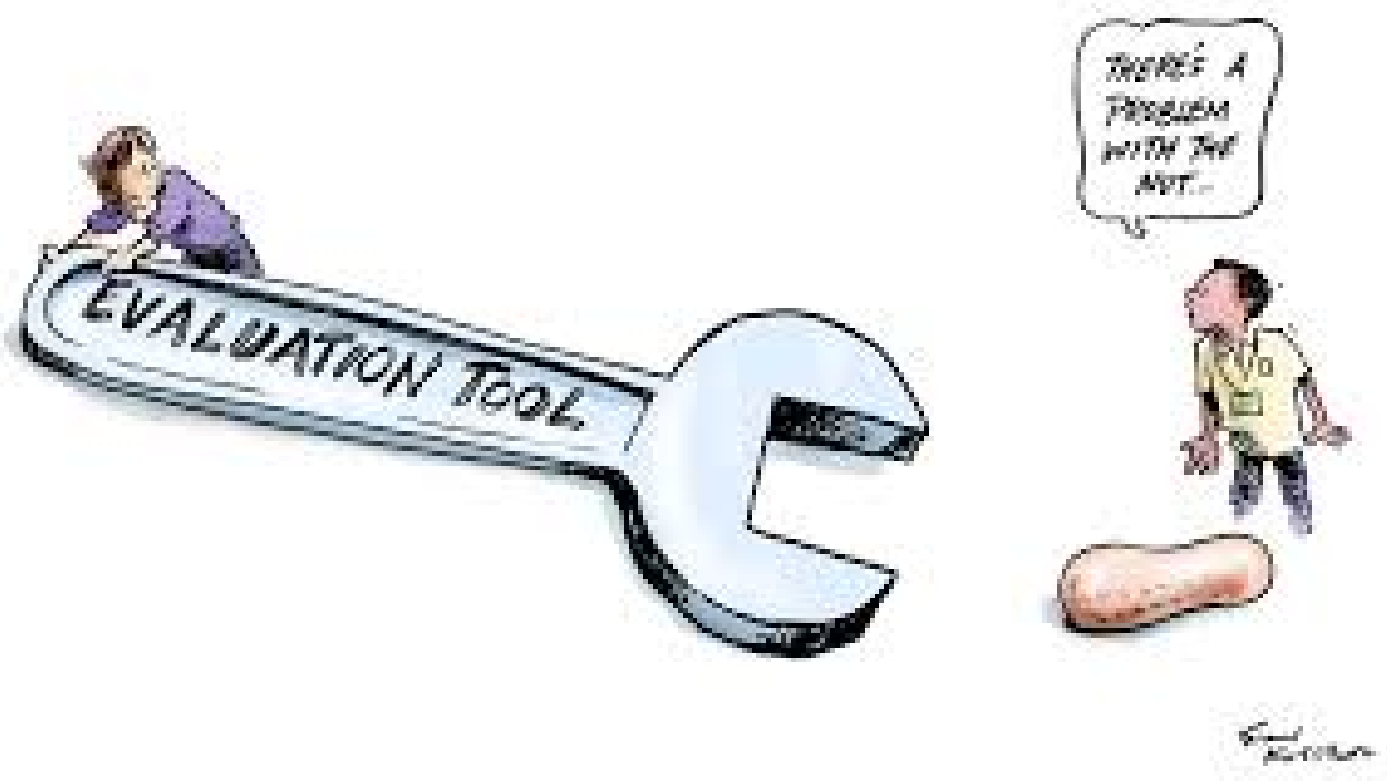
# MIT – Manuals of Indicators Trap

- Evaluating Catching up :
  - Start including surrounding indicators since the begining
  - Beyond manuals
  - Behavioral indicators to be added

# Go beyond crowding in/out



# Rigour is not incompatible with Vigour



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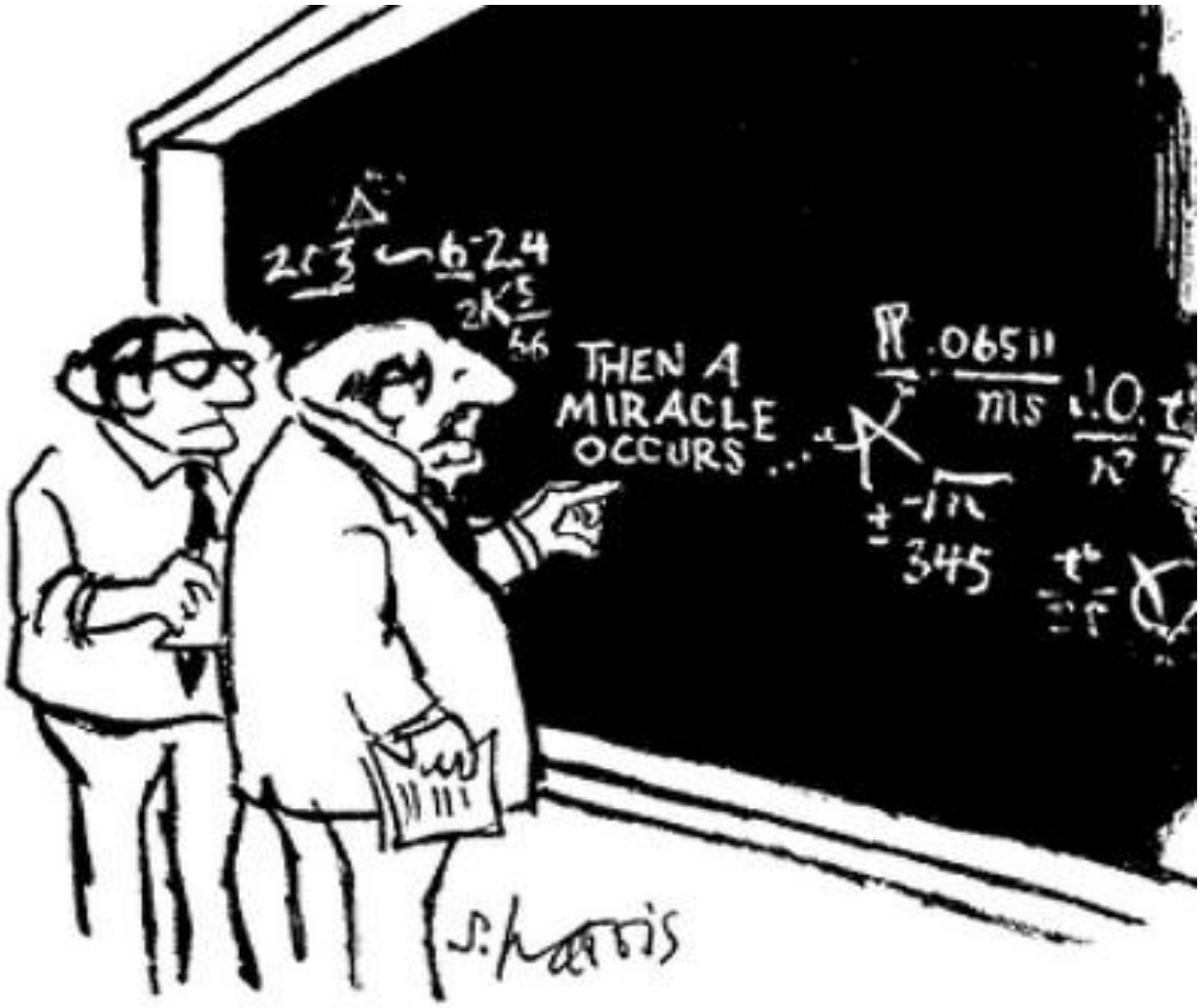
# STI Policy Evaluation and Catching up in Latin America




"I think you should be more explicit here in step two."

Source: https://www.theoryofchange.org/what-is-theory-of-change/

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sallesfi@fapesp.br

# THANK YOU