Science and Technology Parks in Emerging Countries: Panacea or Pipedream?

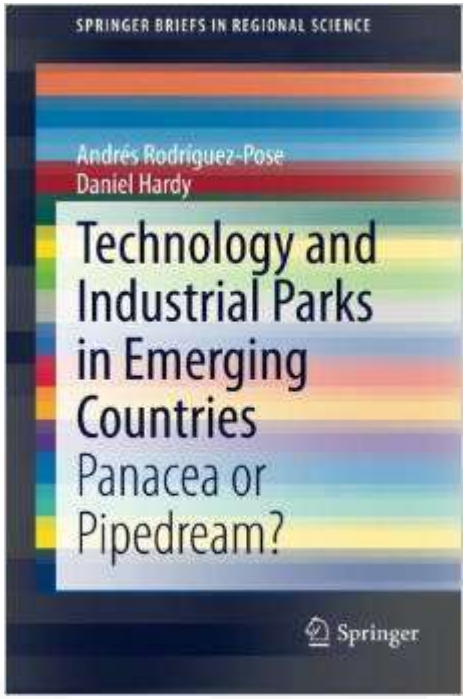
Andrés Rodríguez-Pose

London School of Economics and Political Science

LSE THE LONDON SCHOOL OF ECONOMICS AND POLITICAL SCIENCE

Science and Technology Park Trends

- Rapid dispersion of the STPs phenomenon (World STP population now > 1000s)
  - *Exponential growth in last two decades.*
  - *Today, almost 300 STPs identified in 16 emerging countries studied (few active 20 years ago).*
- Universities are taking a more active role in creating (smaller) STPs.
- More involvement from the private sector.
- Higher level of integration between STPs and metropolitan/regional strategies



Variety of Park Models

Management Support	Technology Level: Low	Technology Level: -	Technology Level: High
Low	Industrial Park	Business Park	Science/Research Park
-	Managed Workshop	Enterprise Zone	Innovation Centre
High	Business Incubator	Business and Innovation Centre	Technology Park/Centre

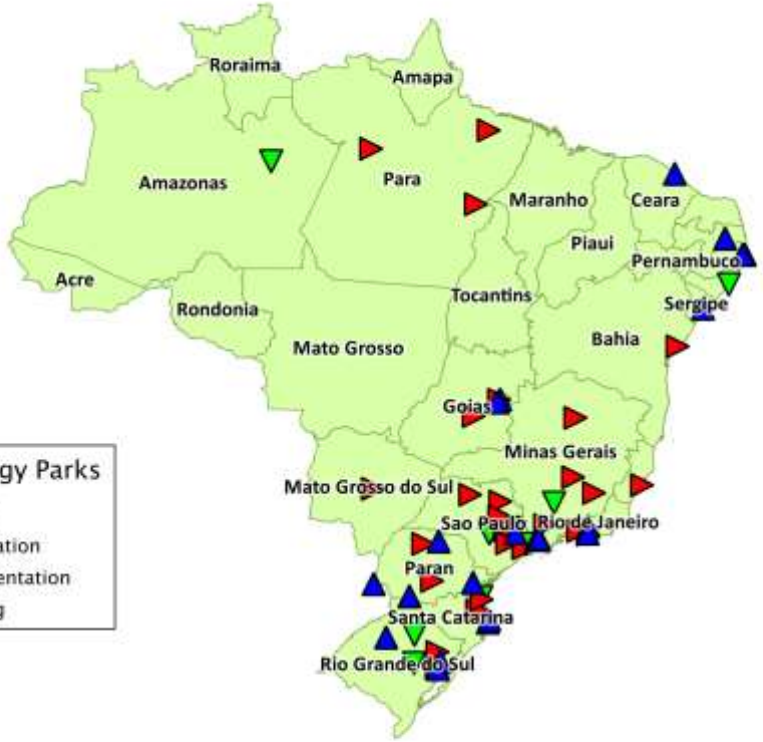
Source: Authors elaboration, based on an European Commission (2002) report.

Taking Stock in Emerging Economies

- **Accelerated in popularity in emerging countries**
  - *We study 16 countries (China, India, Malaysia, Philippines, Brazil, Mexico, Argentina, Colombia, Venezuela, Chile, Peru, Uruguay, Dominican Republic, South Africa, Tunisia, Jordan)*
  - *Only a handful of parks active in the 1980s.*
  - *Nearly 300 identified as active today (100 in China alone).*
- **Huge diversity of contexts**
  - *From the mega-cities of Sao Paulo, Beijing and Manila.*
  - *To isolated, provincial towns and cities (Many examples in cities <100k pop.).*
- **Different shapes and sizes**
  - *From integrated, city-wide developments (Beijing Experimental Zone)*
  - *To 'boutique' parks (few in Brazil exceed 5ha in size – many < 1ha).*
  - *Some parks highly specialised (agroparks, ICT parks).*
  - *Other very generalised (standard infrastructure, office space).*

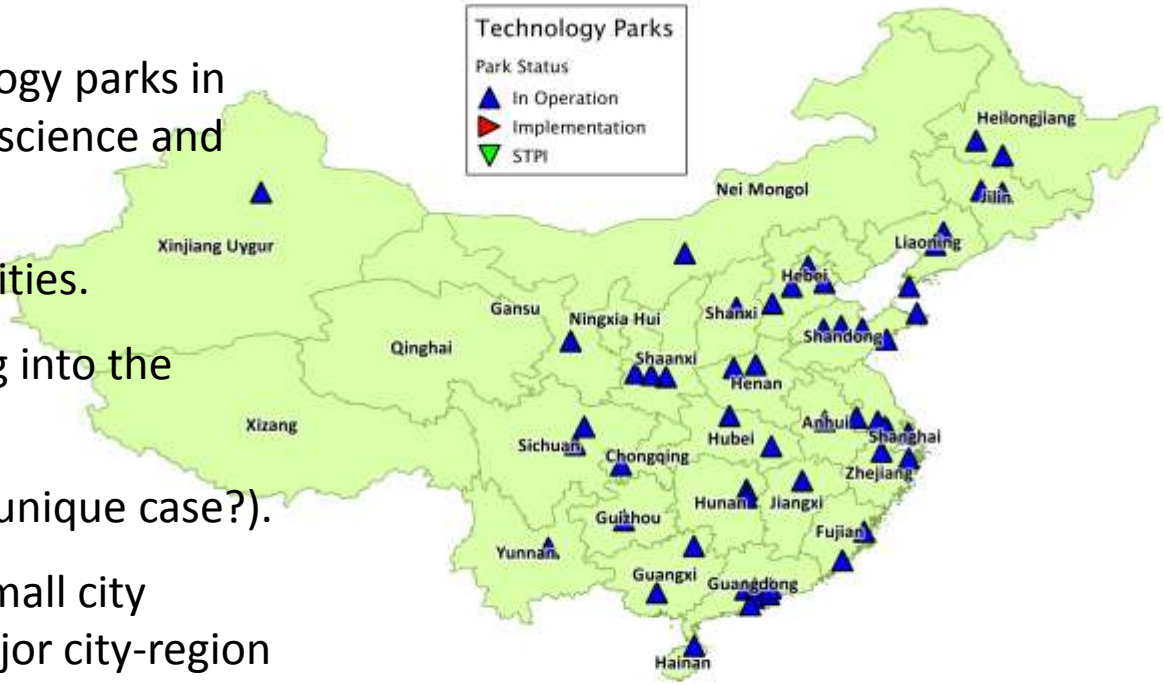
Brazil

- First park established in 1984..
- 22 active by 2011.
- Biggest concentrations around southern metropolises (Säo Paulo, Rio de Janeiro and Porto Alegre).
- Campinas Ciatec Technology Park, is one of the largest and most dynamic in Latin America.
- Parks are typically developed with universities and are relatively small in size.
- It is the larger parks, however, that stand out a leading exemplars (Campinas area, Porto Alegre digital software cluster).



China

- 1st Park under TORCH programme created in Beijing in 1988.
- 1,115 industrial and technology parks in operation (54 national level science and technology zones).
- Most early parks in coastal cities.
- More recent parks spreading into the interior.
- Special dispensation (China unique case?).
- Shenzhen: evolved from a small city (20,000 inhabitants) to a major city-region (15 million) over a period 30 years. Parks a significant park of this development story (Miao and Hall 2014).



Mexico

- Sluggish to start developing STPs.
  - *In spite of considerable experience developing low-value added Industrial parks and Maquiladoras).*
- 24 active (similar number in planning/ implementation).
  - *Tecnológico de Monterrey (ITESM) technology park programme major player in the sector.*
- Most are small
- Relatively high levels of private sector investment.
- Significant concentrations around Mexico City and Guadalajara (forming an axis across central Mexico).
- More recently parks are being constructed in proximity to US border with foreign (mostly US) investment.
  - *Some very large – e.g. the Silicon Border Science and Technology Park)*

Challenges for STPs in Emerging Countries

- Scarcity of world class, research-intensive universities.
  - *Only 12 rank in the top 300 universities.*
- Investment in R&D low in comparison with developed
- countries.
- Governments and universities responsible for a large proportion of R&D investment.
- Weak innovation culture and poor supporting R&D infrastructure.
- Cultural and legislative barriers to R&D for many years.
  - *Insufficient incentive mechanisms.*
  - *Disconnection between research and industry.*
  - *Barriers to academic entrepreneurship.*

World Class Universities

China	(7) Peking University, Shanghai Jiao Tong University, Tsinghua University, Zhejiang University, Fudan University, Nanjing University, and University of Science and Technology of China.
Brazil	(2) University of São Paulo and State University of Campinas.
Argentina	(1) University of Buenos Aires.
Mexico	(1) National Autonomous University of Mexico
South Africa	(1) University of Cape Town

Characteristics of Successful STPs

Success stories are evident, if somewhat predictable.

- Strong (lasting and coordinated) government support at all levels.
- Financial autonomy and sufficient management independence (avoids the temptation to degrade entry criteria to meet secure funding).
- Durable linkages with leading research intensive institutions (universities, research centres, or 'anchor tenants'/foreign multinationals).
- Proximity to cities with pre-existing supplies of skilled labour and knowledge-intensive firms (areas that are able to retain talented workers).
- Start-up incubation and support for nascent NTBFs (new technology-based firms) to become self-sustaining (either within the park itself, or the territory).

- **Exceptions are few and far between.**

Some Exceptions

- **Success relies upon tapping into existing capacities.**
  - *Specialisation of university/research centre.*
  - *Existing cluster of firms.*
  - *Natural resources, raw materials.*
- **Generally small in scale and narrow in scope (limited resources).**
  - *Offer only modest contributions to national/regional development.*
- PADETEC Technology Development Park (Ceará - North East Brazil)
  - *Chemical products derived from local flora expertise of linked university.*
  - *Evidence of academic enterprise (Ipiranga et al 2010).*
- Mianyang Scientific and Technology Park (Sichuan - Central China)
  - *Developed in 1992, 100km from Chengdu, in a small city (by Chinese standards)*
  - *Now an important innovative centre for the electronics industry, and one of China's fastest growing parks (Hu 2007).*

Challenges and Common Pitfalls

- **Quality rather than quantity.**
  - Many STPs suffer from insufficient know-how and best practices.
  - Too many STPs established with property-based development logic.
- **Ineffective incentive packages.**
  - *Too many subsidies and tax advantages, competing on cost rather than quality.*
  - *Pervasive territorial competition.*
- **Insufficient attention paid to institutional development**
  - *Technology/business support packages (consultancy on IPR, access to technical and financial resources for the commercialisation of R&D).*
  - *Technology transfer mechanisms.*
  - *Human capital development and retention.*
- **Too few special purpose STPs.**
  - *Suggesting that regional capacities and priorities are frequently ignored.*
- **Insufficient financial support.**
  - *Assurance of financial support for initial setup and nascent phase.*
  - *But, too often funding is withdrawn too early, before parks are able to become self-sustaining.*

Making the most of STPs

- Strict adherence to a clear long-term vision and purpose (master plan).
- Central involvement of at least one major research organisation which:
  - *Understands that STPs are unique engine for high tech economic growth.*
  - *Has strong knowledge transfer capabilities.*
  - *Takes a collaborative approach that accommodates the needs of industry.*
- Strong interaction between the host academic/research campus and the Park (sensitive to distance, role of proximity)
- Innovative and entrepreneurial project champion (South Africa)
- STP Management with strong leadership skills, sufficient autonomy and financial interdependence.
- Regulated entry.
- Support from the government (of sufficient duration) (supportive environment).
- Effective economic integration within the surrounding region.

Conclusions (The Panaceas)

- Where parks have been implemented in:
  - *Areas capable of sustaining them (existing firms, skilled labour, leading university/research institution)*
  - *With consideration of the local environment (i.e. tailored to enhance the above capacities).*
  - *Have received sufficient resources and support (to the point of self-sustainability)*
  - ***The dividends are there to be reaped.***
- *Several major cities across the emerging world have harnessed parks as part of wider development strategies to form successful innovation systems.*
  - *Metro Manila (the Philippines), Campinas region (Brazil), Kuala Lumpur (Malaysia), Beijing (China).*

Conclusions (the Pipedreams)

- **Many pitfalls if local environment is ignored.**
  - *In the best case, STPs operate in isolation from the local environment.*
  - *In the worst case, STPs become a complete waste of scarce development resources.*
- **As such, there is a great need…**
  - *…for greater levels of public investment to attract FDI, which is facilitated by the rationalisation of clear rules and legal certainty.*
  - *…to address the low levels of experience found in the planning, implementation, and operation of the parks, particularly in terms of the business, financing, and networking aspects.*
  - *…for greater engagement between academic leaders and technology park projects, particularly in terms of harnessing university knowledge resources for entrepreneurship and innovation.*
  - *…to articulate and coordinate park strategies, both regionally and nationally, to engender a system of initiatives that complement, rather than undermine, each other.*