

# Review of the Costa Rican Innovation System

Key policy issues

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# I. Socio-economic environments

## 1. Costa Rica: "Happiest country"

- Democratic country:
  - ✓ stable and fair electoral system, committed to the protection of human rights, with well-developed institutions of the rule of law
  - ✓ strongly pursuing equity in public policies, such as free and compulsory basic education and a good public health care system
- Blessed with rich bio-resources
  - ✓ Rich biodiversity, beautiful natural sceneries, and pleasant weather
  - ✓ Pioneers in environmental protection and eco-tourism
- "Happiest country" -- path-dependent?

## 2. Recent economic performance

● **Costa Rica: A small open economy** that has made a significant transformation over the last decades (1990-2010)

✓ GDP/capita: \$2,411 → \$7,938

✓ Exports: \$2.2B → \$13.6B

✓ Main export: agriculture → high-tech products

✓ Employment in agriculture: 25.9% → 14.9%

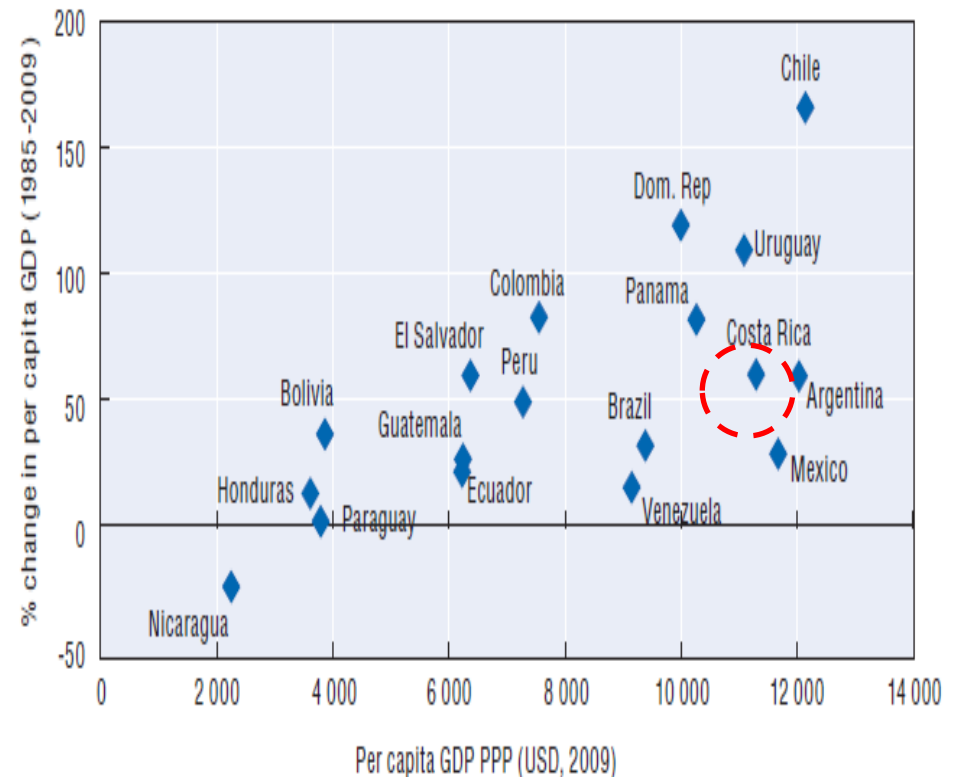
✓ Population under poverty line: 8.45% → 3.12%

● **Key strategy**

✓ Export promotion

✓ FDI based industrialization

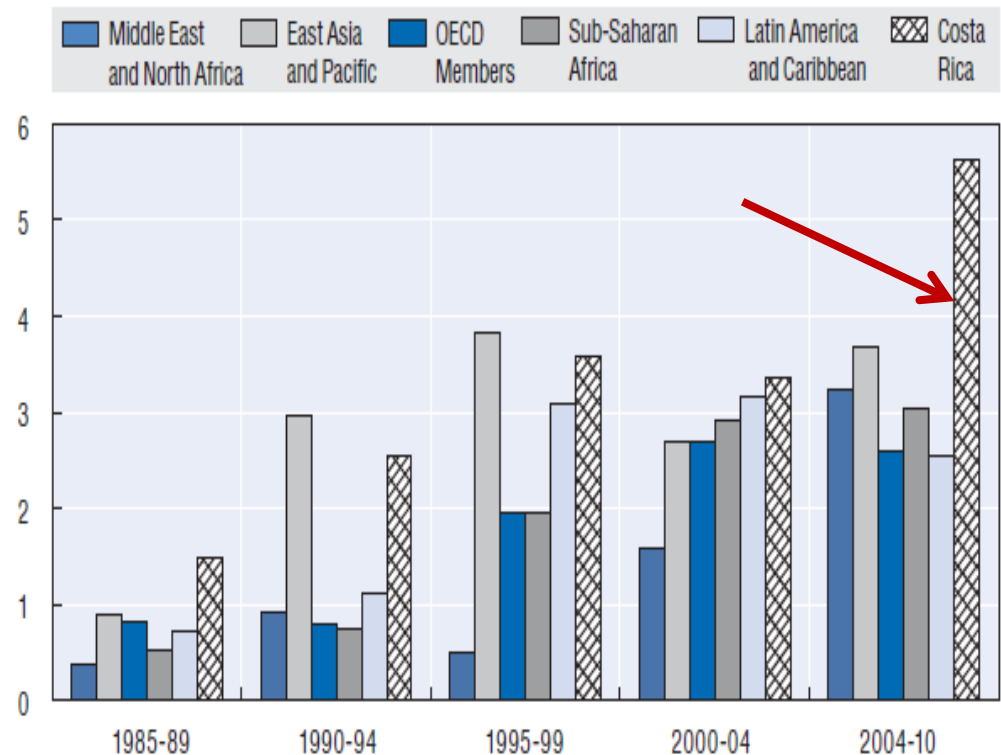
Latin American GDP/c: 1985-2009



## *High growth based on FDI and export*

- Total FDI inflows have grown at an average annual growth rate of 13.5% since the year 2000
- In 2004-10, FDI accounted for 5.6% of GDP, one of the highest in the world
- FDI inflows have financed more than 90% of the current deficit over the past decade
- FDI created 66,200 jobs during the period 2010-2011

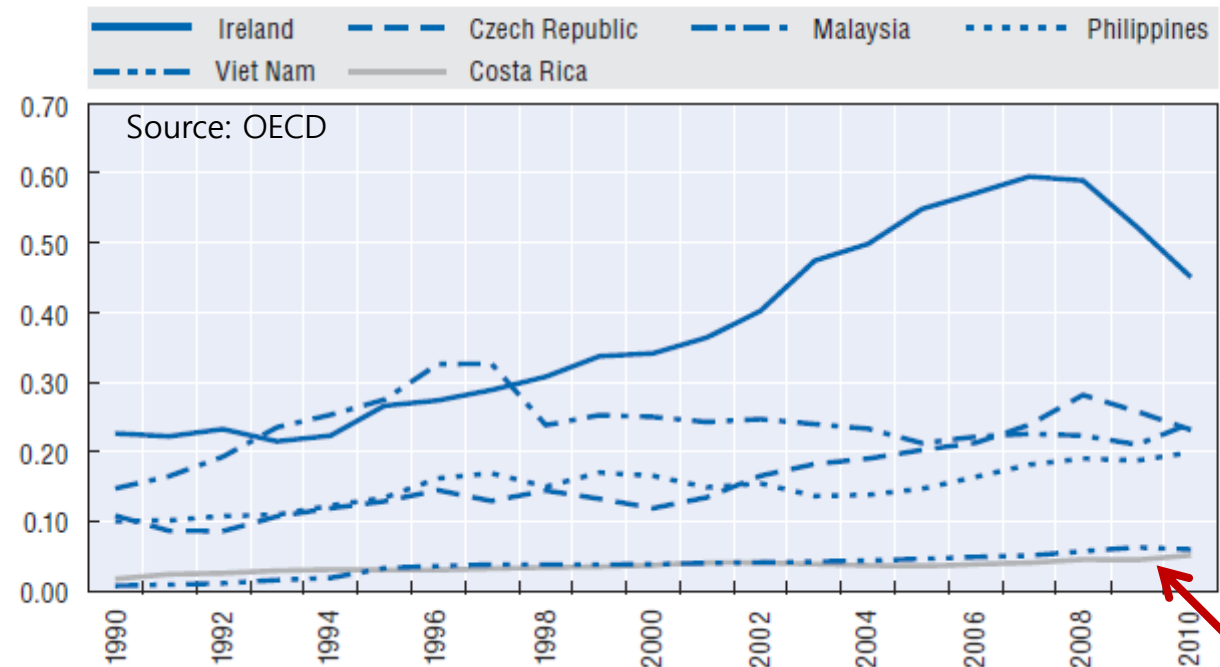
FDI in selected economies: 1985-2010  
(net inflows as percentage of GDP)



***But the potential benefits of FDI have not been fully utilized***

- Limited learning effects: production technologies, management skills, and marketing know-hows

Figure 1.25. Country share of value-added of knowledge- and technology-intensive industries in total world value-added of those industries, Costa Rica and selected economies, 1990-2010



**Mainly due to the weak supply capability of domestic industries and weak linkage between local and FDI companies:**

- FDI firms make most of their purchases of local products and services in non-critical areas such as labels and packaging or support activities like security, cleaning and food.
- Local industry has not been very successful in linking local value chains to the global value chains through FDI firms and exports.

# The share of local purchases in FDI companies' total expenditures by industry

- The higher is the technological intensity of the industry, the lower is the dependence on local supplies
- Inability of local companies to utilize the technological opportunities offered by FDI
- Weak technological absorptive capacity

	2006	2007	2008	2009	2010
Livestock and fisheries	87.5	95.2	97.1	97.5	98.9
Agriculture and food	83.9	85.4	83.5	90.3	83.1
Services	24.9	36.1	37.9	67.5	65.2
Metal working	49.3	42.6	45.5	43.6	45.1
Precision/medical devices	9.5	13.1	12.8	23.8	17.9
Plastic and rubber	21.4	21.6	18.9	20.5	16.9
Textiles	7.1	7.1	9.6	9.4	14.7
Chemical and pharma	41.9	45.3	49.7	8.4	11.5
Machinery, electric parts	2.1	2.2	2.0	3.9	2.5

Source: PROCOMER and BCCR

### 3. Policy implications

- **The key** to development at this stage is **local supply capability** and **technological learning capacity**
- **The growth based on FDI and export promotion** will soon reach a plateau, if CR fails to strengthen its S&T learning capacity
- **Policy action** required: Strengthening **innovation system**

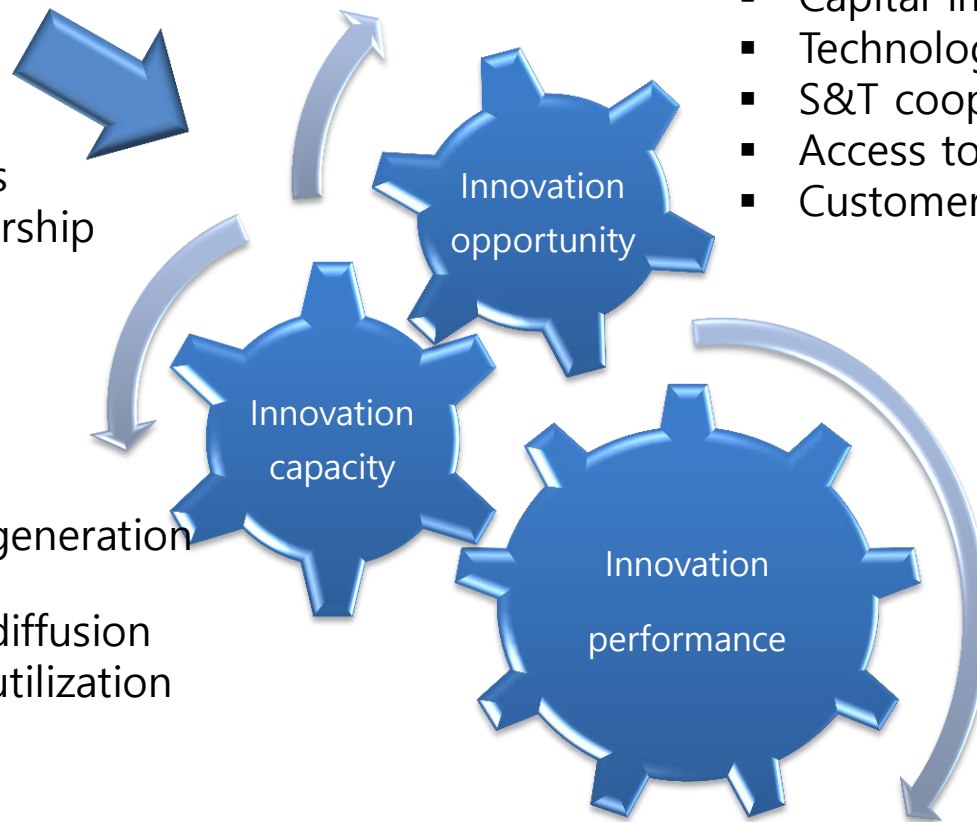
## II. CR innovation system: a KSP review

### 1. A simple conceptual framework for a small open developing economy

#### Pressure for innovation

- Competitive pressure
- Sense of crisis
- Political leadership

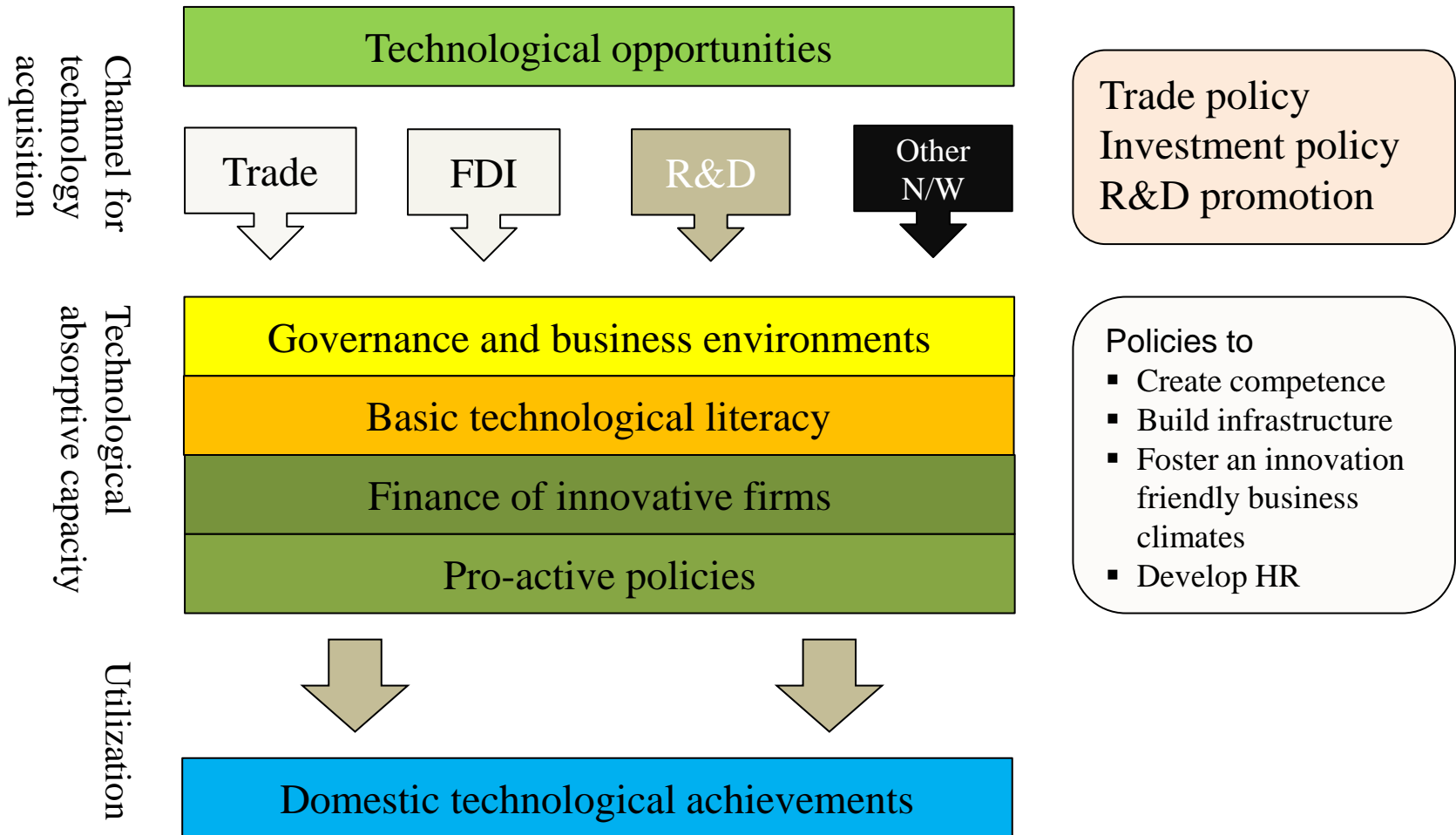
- Inward FDI
- Capital importation
- Technology licensing
- S&T cooperation
- Access to market
- Customers, etc.



- Knowledge generation
  - RD&E
- Knowledge diffusion
- Knowledge utilization

- Growth
- Social development
- Competitive-ness





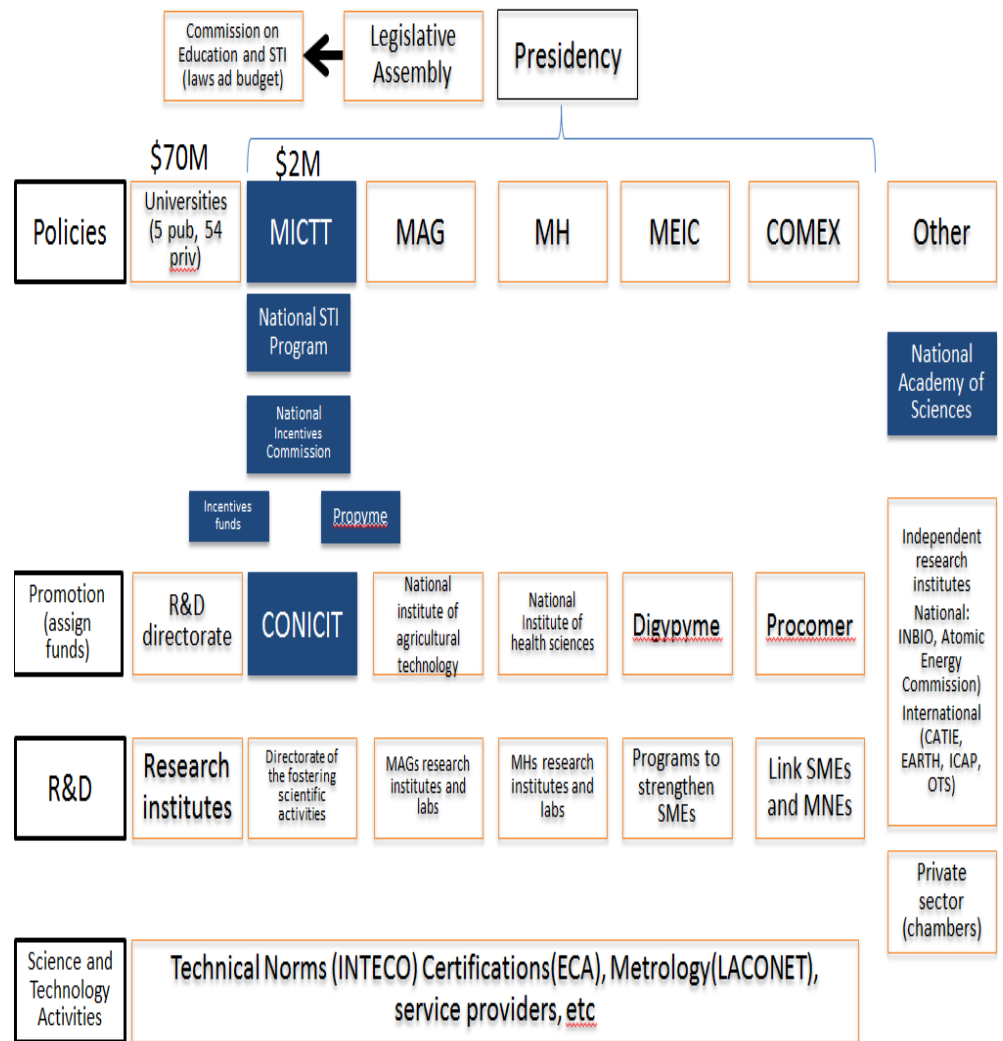
**The process through which opportunities are translated into market values**

## 2. CR Innovation opportunity

- FDI: 5.6% of GDP (2004-10) – one of world's most FDI intensive economies
  - Knowledge and technology-intensive FDIs (electronics, medical devices, tourism and business services.)
  - Creating jobs for skilled workers – 66,200 jobs in 2011
  - Offering new business and technological learning opportunities for skilled workers and local firms
- International trade: 80% of GDP
  - Interactions with foreign companies and exposure to new technologies
- FTA with many countries
- Access to major markets: US, Mexico, Canada, etc.
- Open society with a large bilingual population

### 3. CR S&T system

- Decentralized system
  - Autonomous
- Lacking coherence
  - Insufficient linkages between S&T policy and sector policies
- Lacking coordination
  - The performance of PCCI: not so significant
- Severe resource constraint
  - Both human and financial
- Insufficient incentives:
  - PROPYME, Incentive funds (App US\$ 2mil)
- No planning and evaluation systems
  - Policy planning and evaluation
  - R&D planning and evaluation

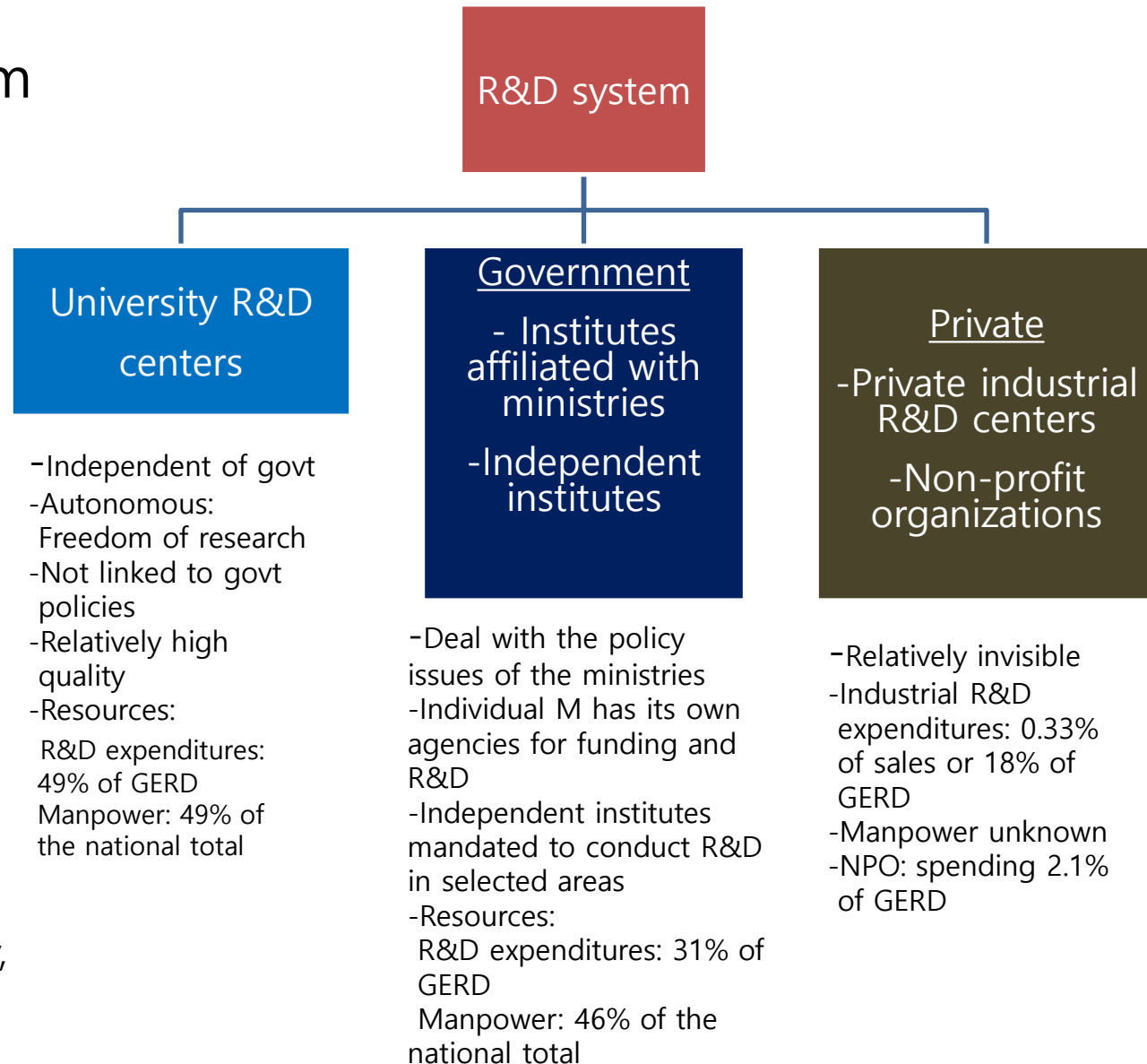


Source: CPC

## ● CR R&D system

### -Key players:

- Universities, govt, and industries
- University-dominant system (Re high Q)
- GERD: 0.46% of GDP or US\$135.5 million
- R&D manpower: 3,970 or 1.7 per 1,000 EAP
- Suffering from severe lack of resources
- Fragmented, weak linkages between players
- Inefficient: Lack of focus : Small funds spread thinly over many projects
- Potential strength: life science, biotechnology, S/W, agriculture, etc.



## 4. CR Innovation capacity

### ● Knowledge generation:

- R&D expenditures: 0.45% of GDP(2011); Korea 4.1%, US 2.9%, Singapore 2.7%, Latin America 0.7% (most recent years)
- R&D personnel: 1.7 per 1000 EAP; Korea 11.5, US 9.2, Latin America 0.8 (most recent year)
- Quality of R&D institutions: Ranked 33<sup>rd</sup> in WEF GCI (2012)
- Knowledge generation: 112<sup>nd</sup> (GII, 2012)

### ● Knowledge diffusion:

- University education: University enrollment rate 25%
- Science and engineering graduates: 11% (social sciences 69%)
- University-industry collaboration: Rare
- ICT infrastructure; Adoption and use of ICT: ranked 66<sup>th</sup> (WB ICI)

### ● Knowledge utilization:

- Doing business environments: ranked 119<sup>th</sup> (WEF GCI)
- Starting business: ranked 93<sup>rd</sup> (WIPO/Insead GII)
- Infrastructure: very weak

## 5. CR Pressure/desire for innovation

- Political commitment

- Strengthened role of the Ministry of Science, Technology and Telecommunications (MICITT)
- Creation of the National Technology University
- National STI Development Plans (5year)
- Century XXI Strategy, etc.

- Incentives for innovation

- Limited – Propyme fund, Incentive fund
- Market competition: Segmented market
- Evaluation system: None

- Pressure for innovation

- Sense of urgency about the need of innovation?

## 6. CR Innovation system: KSP review summary

	Key elements	Rating	Remarks
Opportunities for innovation (Technological learning opportunity)	<ul style="list-style-type: none"> <li>▪ Openness to trade</li> <li>▪ FTI</li> <li>▪ Capital goods imports</li> <li>▪ Access to major markets</li> <li>▪ S&amp;T cooperation</li> </ul>	<ul style="list-style-type: none"> <li>●</li> <li>●</li> <li>◐</li> <li>●</li> <li>◐</li> </ul>	<ul style="list-style-type: none"> <li>▪ FTAs with many countries</li> <li>▪ Active FDI inflow</li> <li>▪ Significant imports of capital</li> <li>▪ Proximity to the US, etc.</li> <li>▪ International coop with the US, Spain and regional countries</li> </ul>
Innovation Capacity	<ul style="list-style-type: none"> <li>▪ Knowledge generation                             <ul style="list-style-type: none"> <li>• R&amp;D expenditures</li> <li>• R&amp;D personnel</li> <li>• Institutions</li> </ul> </li> <li>▪ Knowledge diffusion system                             <ul style="list-style-type: none"> <li>• University education</li> <li>• PPP</li> <li>• Communication system</li> </ul> </li> <li>▪ Knowledge utilization                             <ul style="list-style-type: none"> <li>• Political stability</li> <li>• Doing business</li> <li>• Infrastructure</li> <li>• Institutions</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>○</li> <li>○</li> <li>◐</li> <li>◐</li> <li>◐</li> <li>◐</li> <li>○</li> <li>●</li> <li>○</li> <li>○</li> <li>○</li> </ul>	<ul style="list-style-type: none"> <li>▪ Very insignificant                             <ul style="list-style-type: none"> <li>• Less than 0.5% of GDP</li> <li>• 1.7 per 1000 EA pop</li> <li>• Ranked 33 in terms of quality (WEF GCI)</li> </ul> </li> <li>▪ Overall, not so well functioning                             <ul style="list-style-type: none"> <li>• Social science dominance</li> <li>• Ranked 36 in PPP (WEF)</li> <li>• Adoption and use of ICT (ranked 66, WB ICI)</li> </ul> </li> <li>▪ Very unfavorable business environment                             <ul style="list-style-type: none"> <li>• Ranked 119 (WEF GCI)</li> <li>• Ranked 93 (WIPO GII)</li> </ul> </li> </ul>
Pressure for innovation	<ul style="list-style-type: none"> <li>▪ Political commitment</li> <li>▪ Private sector:                             <ul style="list-style-type: none"> <li>• Incentive system</li> <li>• Market competition</li> </ul> </li> <li>▪ Public sector:                             <ul style="list-style-type: none"> <li>• Evaluation system</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>◐</li> <li>◐</li> <li>○</li> <li>◐</li> <li>○</li> <li>○</li> </ul>	<ul style="list-style-type: none"> <li>▪ Strong but not translated into action</li> <li>▪ Few policy incentives for private innovation</li> <li>▪ Industry dominated by small subsistence enterprises</li> <li>▪ No evaluation based on innovation performance</li> </ul>

● High, ◐ Medium, ○ Low

## KSP assessment concurs roughly with those of other international organizations

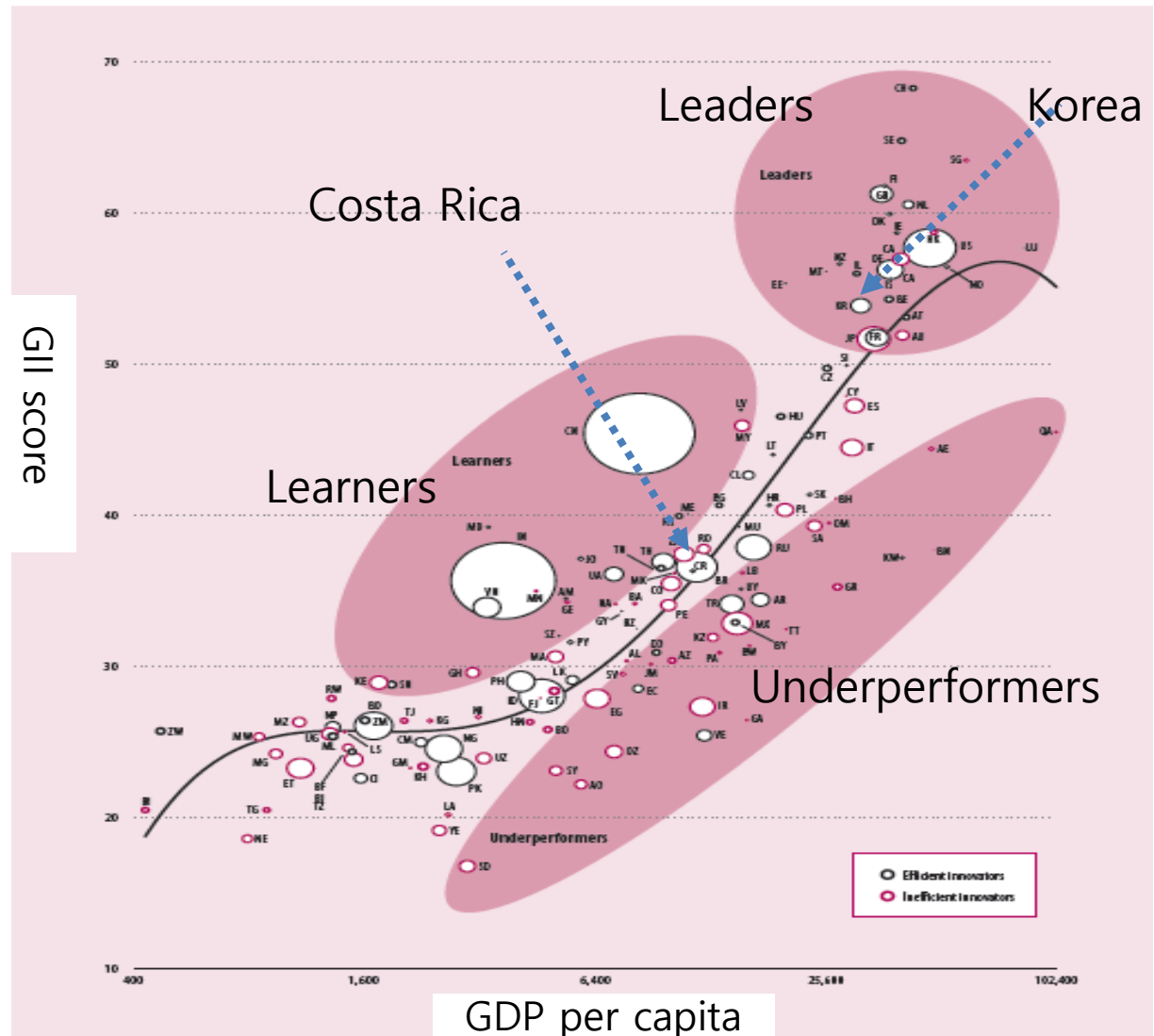
	CR's rank	Strength*	Weakness**	Remarks
WB Innovation capacity index 2011-12	59/130	<ul style="list-style-type: none"> <li>Good governance</li> <li>Human capital</li> </ul>	<ul style="list-style-type: none"> <li>R&amp;D infrastructure</li> <li>Doing business environment</li> <li>Industrial environment</li> </ul>	<ul style="list-style-type: none"> <li>Investment-driven</li> <li>Key: Ability to adopt and improve existing technologies</li> </ul>
UNDP National technology achievement index 1999-2000	36/112	<ul style="list-style-type: none"> <li>High-tech exports</li> </ul>	<ul style="list-style-type: none"> <li>Technology creation</li> </ul>	<ul style="list-style-type: none"> <li>Potential leader</li> <li>High skill level, but little innovation</li> </ul>
UNCTAD Innovation capability index 2001	58/117			<ul style="list-style-type: none"> <li>Innovation capability: medium level</li> </ul>
WIPO/INSEAD Global innovation index 2012	60/141	<ul style="list-style-type: none"> <li>High-tech exports</li> <li>Environmental performance</li> <li>Market access</li> </ul>	<ul style="list-style-type: none"> <li>Business environment</li> <li>University education</li> <li>Knowledge creation</li> <li>Infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>Upper middle income country</li> </ul>
WEF Global competitiveness index 2012-13	57/144	<ul style="list-style-type: none"> <li>FDI inflow</li> <li>Industrial relationship</li> </ul>	<ul style="list-style-type: none"> <li>Infrastructure</li> <li>Financial system</li> </ul>	<ul style="list-style-type: none"> <li>Efficiency-enhancer</li> <li>Key: Ability to harness the benefits of existing technologies</li> </ul>

\* Significantly high ranked items; \*\* significantly low ranked items



# Costa Rica

- WIPO/INSEAD  
2012 GII: “belong to the group of learners”
- WEF GCI 2012-13: Efficiency-enhancer  
“the key is the ability to harness the benefits of existing technologies”
- KSP assessment:  
“active FDI based learning stage”  
“CR has to start with strengthening its learning capability to move ahead to an innovation-driven economy”



Source: WIPO/Insead, GII 2012

# 7. SWOT of CR innovation system

## ● Strengths and Weaknesses

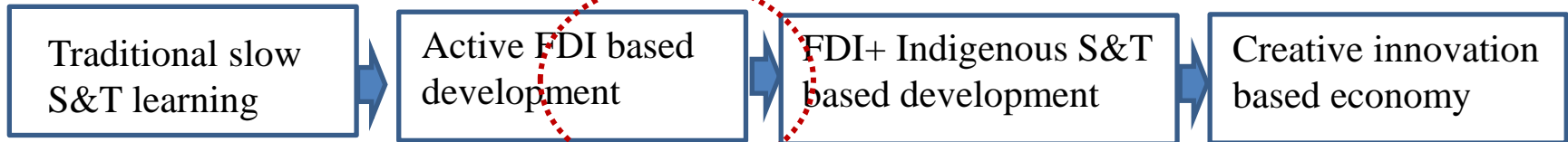
Strengths	Weaknesses
<ul style="list-style-type: none"><li>● Relatively well developed education system</li><li>● High quality education of public universities</li><li>● Ability to meet the business service demand of FDI firms</li><li>● Strength in SW</li><li>● Ability to attract FDI</li><li>● Access to US market</li><li>● FTA agreements with various countries</li><li>● Socio-political stability (Democracy)</li><li>● Stable macroeconomic environments</li><li>● Rich bio-diversity</li><li>● Open society with large bilingual population</li></ul>	<ul style="list-style-type: none"><li>● Small economy</li><li>● Lack of critical mass in scientific and technological research and innovation</li><li>● Insufficient investment in RD&amp;I</li><li>● High attrition rate at secondary education</li><li>● Imbalance in university education – concentration on social sciences</li><li>● Weak linkages between FDI firms and local firms</li><li>● Weak PPP</li><li>● Lack of efficient financial system</li><li>● Insufficient incentives for innovation</li><li>● Physical and institutional infrastructure (Business environment)</li><li>● Lack of pressure for innovation</li></ul>

## ● Opportunities and threats

Opportunities	Threats
<ul style="list-style-type: none"><li>● Globalization and FTAs – widening opportunities for Costa Rica to attract foreign investments and technologies</li><li>● Government's strong commitment to the promotion of science, technology and innovation – new incentives, improved environments for business and innovation</li><li>● Possibility to develop new industries with international comparative advantage based on natural resources, such as bio-diversity, natural environments, etc.</li><li>● Growing cooperation with regional countries in trade, technology and education – overcoming the disadvantage of being small</li></ul>	<ul style="list-style-type: none"><li>● Uncertainty and instability of the global economy</li><li>● Shortage of high-caliber scientists and engineers</li><li>● Growing competition for FDI attraction</li><li>● Weakening linkage between FDI firms and local firms</li></ul>

# III. Where CR is and where to go

CR in the past  $\Longrightarrow$  CR today  $\Longrightarrow$  CR M-T Goal  $\Longrightarrow$  CR L-T Goal



- Relying on traditional technology
- Low S&T learning capacity
- Minimal learning opportunity
- High risk of further marginalization
- Urgent need of international assistance

- Attract and diversify FDI and exports
- **Local supply base**
- Relatively **high S&T learning capacity**
- Gov't strategy to build human capital and **accelerate S&T learning**

- **High S&T capability**
- Reduced reliance on FDI for technology
- Structural transformation of industries
- Active gov't strategy to **develop HR and promote innovation** through various means – own R&D, FDI, technical cooperation, etc.

- **World level capacity for absorbing and generating technology**
- Global **technological leadership** in some niches
- Active participation in international **S&T coop**
- Active **S&T strategies to enhance indigenous R&D and innovation**

# 1. Short-term policy suggestion

- Policy focus: To strengthen the supply capabilities of local industries and maximize technological spillovers from FDI companies
- Policy actions:
  - ✓ Prioritize and diversify FDI attraction
  - ✓ Improve and strengthen the incentive system (including the FZR) to encourage and promote the linkages between FDI and local companies (technical cooperation, business linkages, etc.)
  - ✓ Strengthen local supply capability
  - ✓ Reform the educational systems to strengthen the technological learning capacity (secondary and tertiary education)
  - ✓ Increase R&D resources – human and financial - in both private and public sectors
  - ✓ Promote R&D and innovation in private sectors: Provide incentives
  - ✓ Improve investment and business environments
  - ✓ Improve infrastructure: Road, railroad, ports, and ICT infrastructure

## 2. Mid-term policy suggestion

- Policy focus: To develop indigenous R&D capability, while at the same time attracting knowledge-intensive FDI as a key channel for technological learning; and to develop industries capable of competing in global niche market.
- Policy actions:
  - ✓ Strengthen the S&T system to build up an S&T foundation for the sustainable long-term growth of the Costa Rican economy.
    - Empower MICITT to function as the central agency for S&T policy formulation, implementation and coordination
    - Create a government think-tank with the functions of conducting technology foresight, research and analysis on the issues of S&T and innovation, and developing S&T policy plans
    - Link the S&T policy to other sector policies and evaluate the effectiveness of S&T policy
  - ✓ Strengthen the national R&D system
  - ✓ Launch mission-oriented national R&D programs targeting at developing technologies to facilitate structural transformation and to develop strategic industries that would compete with MNCs in the certain segments of the global market.

# 3. Long-term policy suggestion

- Policy focus: To move forward to an innovation-driven development stage where Costa Rica has established world leadership in both research and production in selected areas.
- Policy actions:
  - ✓ Nurture world-level talents in the areas of S&T who would lead the world in research and technology development in the fields of their specialties
  - ✓ Invest in R&D and innovation focusing on the areas that promise to be the locomotives of long-term economic and social development of the nation
  - ✓ Pursue consistent STI policy focused on developing Costa Rica's technological core competence as an engine for long-term growth
  - ✓ Develop a national consensus on the need for STI development

# IV. Conclusion

- Costa Rica's efforts toward an innovation-driven economy should start with strengthening its industrial competitiveness in the current structural context, in which FDI companies play a key role.
- In other words, the immediate policy focus should be placed on exploiting fully the technological and economic opportunities that FDI and international trade offer, and strengthening the competitiveness of domestic industries, rather than on engaging too much in scientific research.
- This is important because the FDI-based growth will soon reach a plateau if the supply capability of domestic industries is not strengthened.
- The most pressing short-term issues are: incentive regime, local supply capability, linkage between FDI and local companies, infrastructure, business environments, and education.



- The next step is to make a transition toward a stage where Costa Rica relies less on FDI and becomes more self-reliant in technology and growth. This will be made possible only when Costa Rica has established high technological absorptive capacity and strong indigenous technology base, on which its industries can compete with MNCs in certain segments of the global markets.
- The key to unlocking the door to an innovation-driven economy is human resource.
  - ✓ Costa Rica should maintain and even strengthen its policy that places top priority on fostering best talents.
  - ✓ Continue increasing R&D investments and concentrate the resources on selected strategic areas.
- Most important, innovation policy has to be designed and implemented in a long-term perspective, as only the policy that survives the changes of government can succeed.

**Thank you**