"Is Innovation a Luxury or a Necessity for Developing Countries?"

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Mantener logos pero trabajar con el formato del fondo. (hay algo detrás del logo del CIET que se debe borrar)

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High social return for Developing Countries by Catching up through technology transfer, adaptation and diffusion

Figure 3. Returns to R&D and the Level of Development

- Higher return on R&D for countries far from the frontier instead of Developed Countries... “has to push the frontier forward”.
- Return to R&D rise for countries rich in Natural resources.
R&D needed in Natural Resources sectors due to with significant local Specificity.

• Research on white spot disease in Shrimp Production in Ecuador and salmon diseases in Chile.

• Adaptation of Californian Fruit varieties in Chile in the 60’s and research on local diseases.

• Investment in research for developing sanitary barrier in meet production in Uruguay.

• Research in Peru and Chile in the seventies on the interaction between climate oceanic conditions and anchovy recruitment.

• Development of native aquaculture in Vietnam.
Catching up through technology transfer, adaptation and diffusion

1. **Export Diversification**: Developing and growth of new export oriented sectors. *Insufficient investment in Self discovery.*

2. **Development of Critical mass of companies with Innovation routines**: Incremental innovation in existing firms. *Information Asymmetries, lack of capacities or innovation practices, lack of Technology Infrastructure for testing.*

3. **Promote SMEs Acquisition of Best Practices**: Productivity Dispersion: In LAC misallocation Cost is between 50% to 200% higher than in US. *Information asymmetries, lack of business competences and access to credit, difficulties to collaborates, lack of networks.*
1. Export Diversification and Self Discovery: Addressing Appropriation and Coordination failures

“Self-Discovery as an appropriation failure” (Haussmann- Rodrik 2004)

Solving appropriation failures requires neutral policy instruments toward: increasing demand for innovation, IP protection, entrepreneurship, access to medium term financing, Human Capital investment.

“Self-Discovery as a Coordination Problem” (Charles Sabel 2011)

The need to develop non tradable inputs with economies of scale generates a circular vicious circle, you need a critical mass of demand. Solving Coordination Failures require systematic explicit sector specific policy targeting.

¿How to do it?
Taxonomy of Government Intervention for Business Development and Innovation

Public or semi Public goods

Strong Intervention

Horizontal

- IP Protection
- Bankruptcy Laws
- Contract enforcements by judiciary
- Matching grants
- Tax Credit on R&D
- Subsidies on Training

Vertical

- Sanitary Protection for fruit and meet sector
- Proof of Concept Lab For Specific Technology/sectors
- Technology Consortium in a sector/technology

Appropriation Failures lead to Horizontal Interventions

Coordination Failures lead to Vertical Interventions
1. Instruments for promoting Self discovery: combining Vertical and Horizontal approaches

• Vertical: Technology Institutes 2.0 (TI)
  – Proof of Concept Lab for specific Technology /sectors
  – Proper Incentives. Performance Base Financing (30-40%) plus access to Competitive grants and Contract I&D or Technology services.
  – Promote Spin out and attraction of entrepreneurs.

• Combined with Horizontal Instruments
  – Grants for proof of concept projects co-sponsored by TI and Business with private co financing
  – Support Seed Funds/Angel Networks that could help overcoming the death valley trap.

• Technology Road mapping: Top-down and Bottom up approaches
Examples: a) Fundación Chile, Dealing with Self discovery solving appropriation and coordination Failures

- Private foundation created as initiative of the government in 1976.

- Focus on identifying and developing areas with latent comparative advantages.

- Spin outs in new activities with export potential, based on natural endowments and transfer and adaptation of technology (appropriation failures).

- Also creation of critical services and club goods, divesture and diffusion of the results and training of specialized human capital (coordination failures).
Evolved to a Model Of Open Innovation and tech diffusion

- External Technology sources *
- Universities, Tecnology Centers, Foreing Industry Experts and consultants

Technology and innovation Management

- Internal Technology Management capabilities
- Technology Consorcia
- Spin off of new companies
- Technology Services and certification
- Own Company
- Broad diffusion Technology: Training Labour competence Certification, seminars

- Divesture of Growing new business
- Licensing to existing Companies
- Market

* Universities, Tecnology Centers, Foreing Industry Experts and consultants
b) Technology Road mapping: Systematic identification of coordination failures in Sectors of high potential Top Down Selective Approach

Promotion of Cluster Development Based On Natural Resources Sectors: The Case of Chile

“It is necessary to concentrate on those successful sectors and capitalize our natural advantages in order to create service, product and input-oriented business ventures with more profound knowledge”.

Chile: Salmon from Developing Clusters to Transformation:

Zambia: Copper from enclaves that imports from South Africa to a Developing Cluster

Colombia: Coal from Emerging cluster to a Mature cluster
Key coordination failures

Initial Phase: Top-Down Selective Road mapping, Based on growth Potential, Size and Possibility of solving Coordination Failures.

- Cooperative R & D
- Formation of human capital associated with the dynamic clusters.
- Investment in infrastructure-related needs of clusters
- Tackle regulatory bottlenecks
- Common Technological Infrastructure and platforms
- Critical mass of resources for Mission Oriented research

Second Phase: Combining with Decentralized Road Mapping Bottom-Up
Allowing new emerging sectors with early market signals (allows for serendipity)
Esta diapo va acorde al mapa que desarrollan ellos en la diapo 9. Como son fases, podría quedar mejor con un esquema.
Chilean case ROAD MAPPING FOCUS IN KEY PLATFORMS

- In order to increase productivity and growth in Chile and to Minimized risk of wrong sector targeting.

**Infrastructure and resources**
- Creation and supply of energy
- Water supply and availability of natural resources
- Infrastructure for transport and/or distribution of natural resources
- Infrastructure for telecommunications
- Logistics

**Regulatory, legal and political framework**
- Rule of Law and property rights
- Regulation of competition in market economy
- Transparency in the public and private sectors
- Government support policies in the private sector and for investment
- Labour and environmental regulation

**Finance and Trade**
- General access to the national and international financial systems
- Financial markets efficiency
- Trade and market access

**Transversal technologies**
- Biotechnology
- Information and Communications Technology
- Chemical Engineering in Food Processes
- Nano-science and nanotechnology
- Genomics and Proteomics
Also Cluster Development Became Key Policy Option

• Selective support of Excellence Research Centers

• Technology Road mapping in Key Clusters.

• Identification of Advance Human Capital Gaps

• Identification of Derived demand for Technology Based services.

• Identification and promotion of common Technology platforms and suppliers across clusters.
EXAMPLE OF VERTICAL PROGRAM
In Chile: Mining Cluster transformation

BHP Billiton and Codelco Suppliers Development Program
Mining Cluster

7 Octubre de 2010
Developing World Class Suppliers In the Mining Cluster (two major mining companies)

### Mandate

**today**
- 10,000 Providers of goods and services that directly and indirectly represent 10% of labor force of Chile
- Only a few world class companies (less than 10) with no more than US$ 400 mm in exports (Exp 70 billions)

**2020**
- 250+ World Class providers in Chile(*)
- Diversify in niche sectors that are key for the Mining cluster
- US$ 1,5 billions in Exports
Colombia: Development of the Energy Cluster 2011

- Including main OIL and COAL Mining companies.
- Transfer of Chilean experience.
- Political leadership of DNP and Mining Ministry.
- Participation of Agencies COLCIENCIAS
- ACCESS to Royalty Resources for specific projects

Managing Structure of the program

Figura 3. Estructura organizacional del Programa nacional de proveedores de bienes y servicios
c) Decentralized Technology Road Mapping: Cases Trade Industry Canada, Chile and Colombia

Technology Road Mapping...  
• helps an industry predict the market’s future technology and product needs.  
• defines the “road” that industry must take to compete successfully in tomorrow’s markets  
• guides technology R&D decisions  
• increases collaboration, shared knowledge and new partnerships  
• reduces the risk of costly investment in technology  
• helps the industry seize future marketing opportunities
Bottom up Technology Road mapping Developing Country Cases: INNpulsa Colombia, ARDP Chile

• iINNpulsa-BANCOLDEX (Colombia, Feb. 2012)
  — 16 Pilot regions: Technology and competitiveness Road mapping, selected together by INNpulsa and Regional Competitiveness Councils.
  — Cluster and Suppliers developments. Tecnological infraestrueture

• PROFO PROGRAM 1992 (CORFO CHILE)
  — From 4 companies up, focus on club goods and joint marketing

• Regional Productive Development Agencies (CORFO-CHILE 2008)
  — Focus in Technology and R&D
  — A pilot with 3 projects per region
  — International Expert Advisory for elaboration of road mappings
2. Matching Grants for developing a critical Mass of Innovative Companies

- Critical having business co financing (50%-40%)
- With New Companies: Private intermediaries with proper incentives (Incubators, Angel Networks, Seed Investors).
- Small grants US$ 30-50 (50% co financing) for existing medium size companies with history, focus on ex post evaluation and eligibility criteria.
- Outsource technical evaluation to Consulting companies, provide incentives based on performance.
- Fundamental non burocratic evaluation and disbursement(not more than 90 days).
3. Technology Diffusion to SMEs: Combine supply and demand approaches, technology transfer and adaptation and SME collaboration.

Centers for Technological Extensions (CTE)

- International specialized centers
- Transfer of Know-how
- Technological antenna

CTE package
- Expert capabilities
- Management
- Target SMEs
- Productivity Base line
- Peer collaboration
- Networks and Alliances

Groups of SMEs
- Extension Services
- Thematic Areas

Market Needs

In Developing Countries TI should be key players in Technology adaptation and diffusion
Impact assessment and Evaluation of Programs

• Collaborative Road mapping PROFOS CHILE (1992-1994)
  – Increase in sales (23.6%) and wages (16%)
  – Dynamics effect in sales (60%)
  – Investment of Fiscal Resources Benefit/cost 4

• Matching Grants Chile (1993-1996)
  – Increase in sales (16.9%) and employment (18.9) B/C ratio 9.2

• Co financing R&D COLCIENCIAS Colombia
  – 17% increase in Employment
  – 16% increase in labor productivity.
  – Significant product Innovation and diversification

• Evaluating the Impact of Technology Development Funds in Emerging Economies: Evidence from Latin America (Argentina, Brasil, Chile, Panama)
  – The authors found that TDFs do not crowd out R&D from private sources and that TDFs have a positive impact on the intensity of R&D.
  – Financial support should be accompanied by the infrastructure and technological services of research centers and universities.
Impact assessment and Evaluation of Programs

- Technology Diffusion Programs Fundación Chile (2003): Crop Check Program with participation of farmers, and TT Australia. 50% productivity increase in 3-5 years.
Institutional Development
Essential

• Government failures: Time consistency problems, Rent Seeking and Capture, Agency problems, difficulties for attracting qualified Human capital.

• Institutional Development and Proper Governance for:
  Check and balances, Transparency, accountability, development of Execution and government coordination capabilities.

• What kind of Institutions?
  – Councils for developing Innovation Strategies
  – Coordination Boards on policy design and implementation
  – Implementation Agencies Administrative Autonomy with proper governance and interlocking Directories.
  – Technology Institutes with proper incentives for technology diffusion
  – Collaborative Technology Transfer Organizations for developing bridges between Universities and Business development.
Conclusions

• Innovation is critical for efficient catching up and convergency in developing countries.
• Mission oriented research in natural resource country specific problems.
• Self Discovery requires horizontal and vertical government intervention.
• Coordination Failures could be tackled with Top Down and Bottom up road mapping and sector specific market responsive Technology Centers.
• Matching Grants with Technological Centers providing Proof of Concept and technology Services will enhance impact (more Product innovation).
• Diffusion of Best Practice is critical to reduce productivity dispersion.
• Institutional Development and Systematic Evaluation is critical for success, given relevance of Idiosyncratic factors.