

# Science, Technology and Innovation Policy Instruments (STPI): Background, situation and prospects

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# Structure of the presentation

- Background to science and technology (S&T) policy instruments
  - The STPI Project (1970s)
- Data on S&T policy instruments
- Interpretation of information on S&T policy instruments
- Research on S&T policy design and implementation
- Concluding remarks



# Background to S&T policy instruments

*The STPI project (1973-1979)*



# Background to S&T policy instruments

## *The STPI project (1973-1979)*

- Definition of 'policy' (explicit and implicit) and of 'policy instrument'
- The structure of a policy instrument
- Technology decisions
- Evaluating the performance of policy instruments
- Categories of countries and relevance of policy instruments



# Background to S&T policy instruments

*The STPI project (1973-1979)*



# Background to S&T policy instruments

- **Policy**: a statement of purpose and of criteria made by a high-level authority, generally in the public sector, intended to guide decision-making by other agents
- **Explicit policy**: statement referring directly to the objectives and decisions that policy makers want to influence
- **Implicit policy**: statement referring to other objectives and decisions, different from those that policy makers want to influence, but that have an **indirect effect** in shaping the behavior of agents targeted by the explicit policy

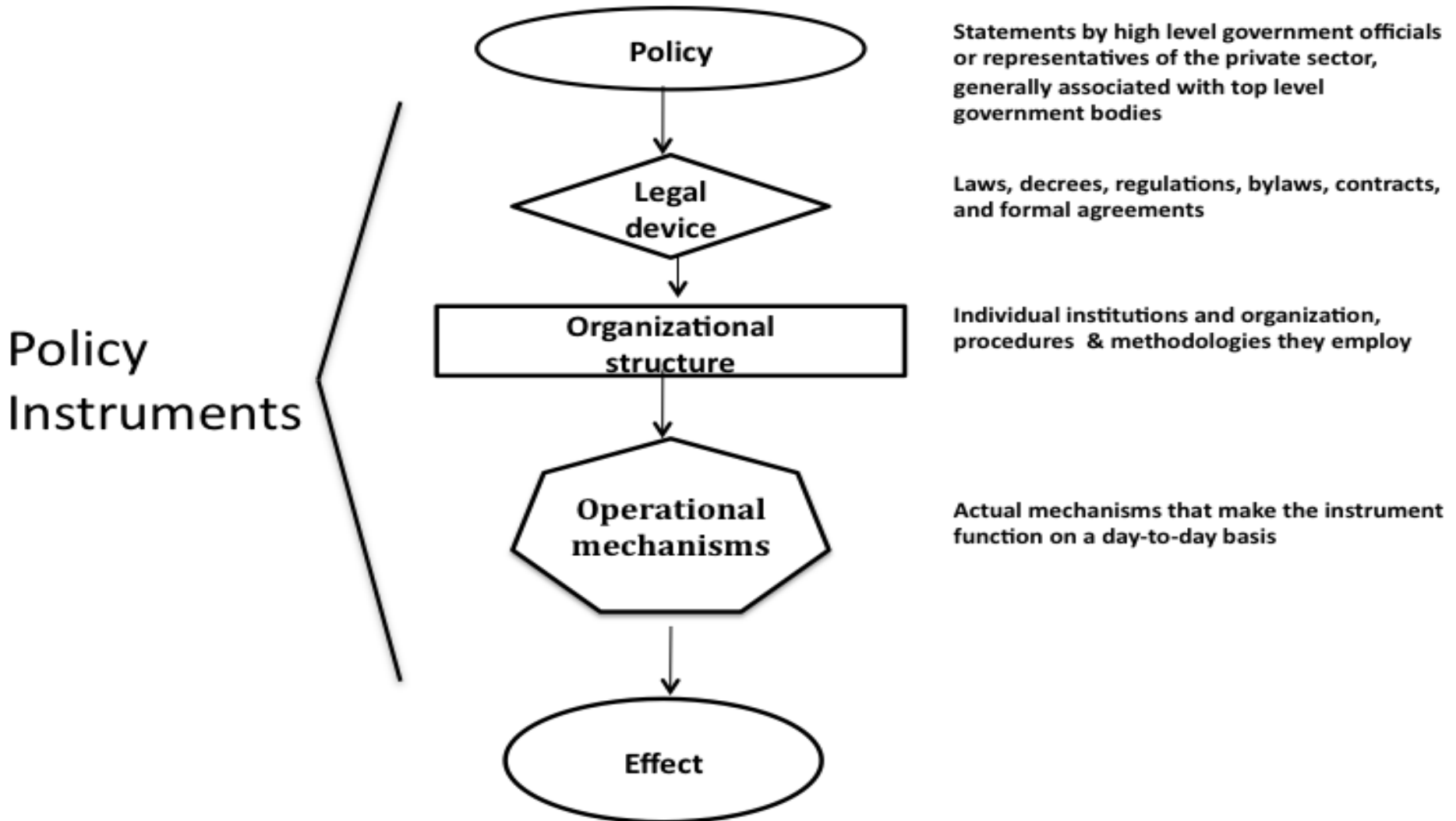


# Background to S&T policy instruments

- *Policy instruments* are the means employed by those who exercise power and authority to influence the decisions made by other agents
- They *induce and motivate* individuals, groups, firms, organizations and institutions to behave in accordance with the guidelines and criteria established by the policies
- They are the *connecting link* between the *purpose expressed in a policy statement* and its *implementation* in practice

# Background to S&T policy instruments

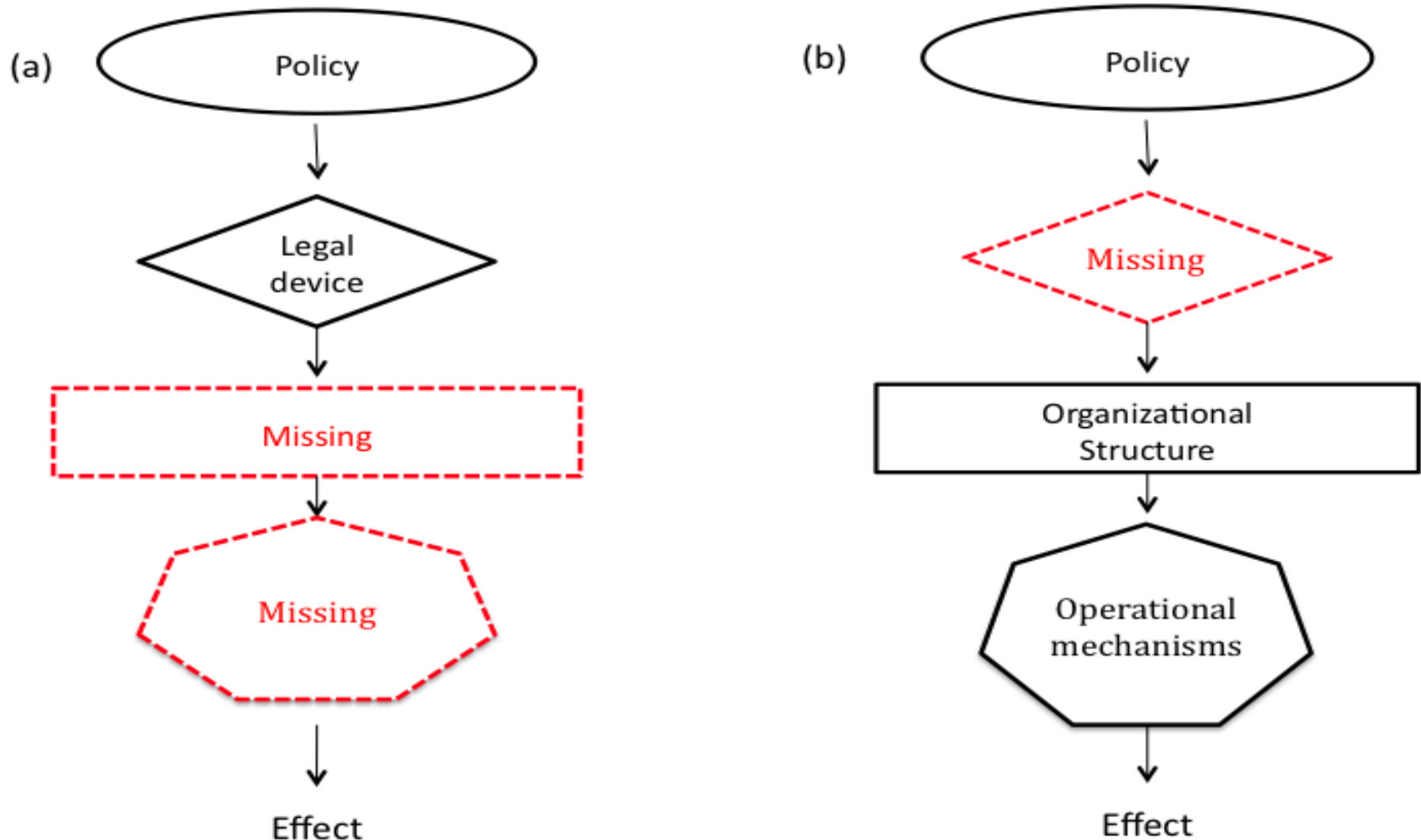
## Structure of a Policy Instrument





# Background to S&T policy instruments

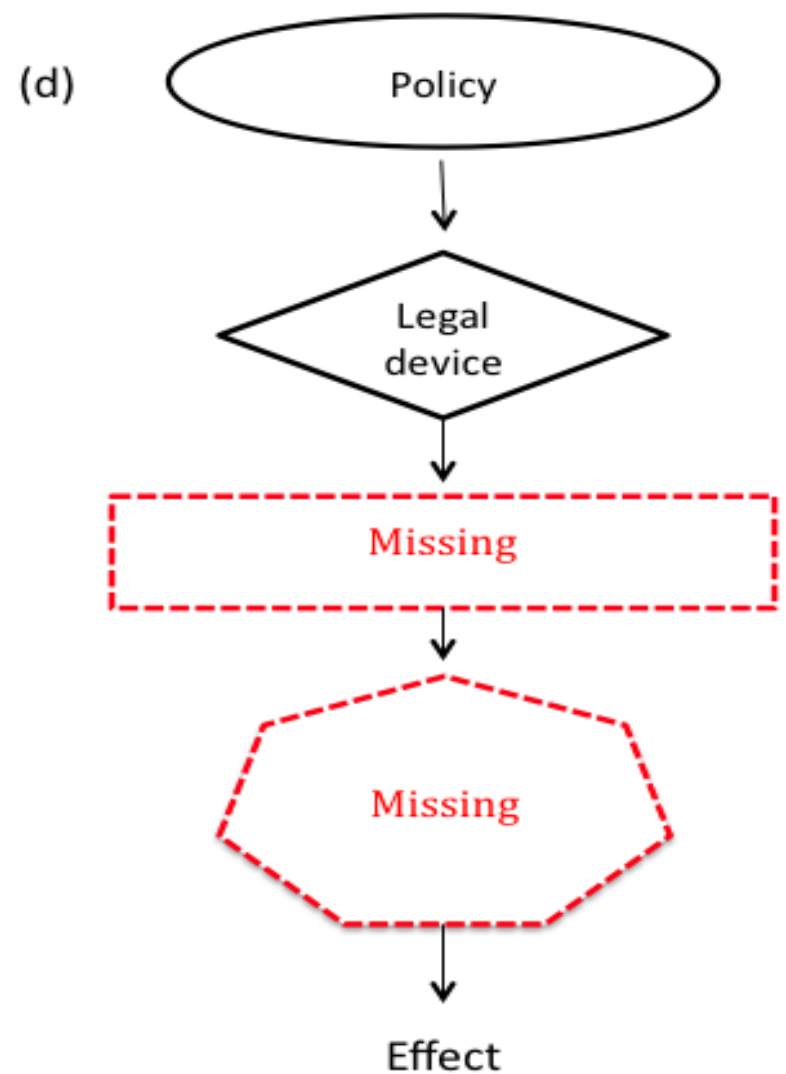
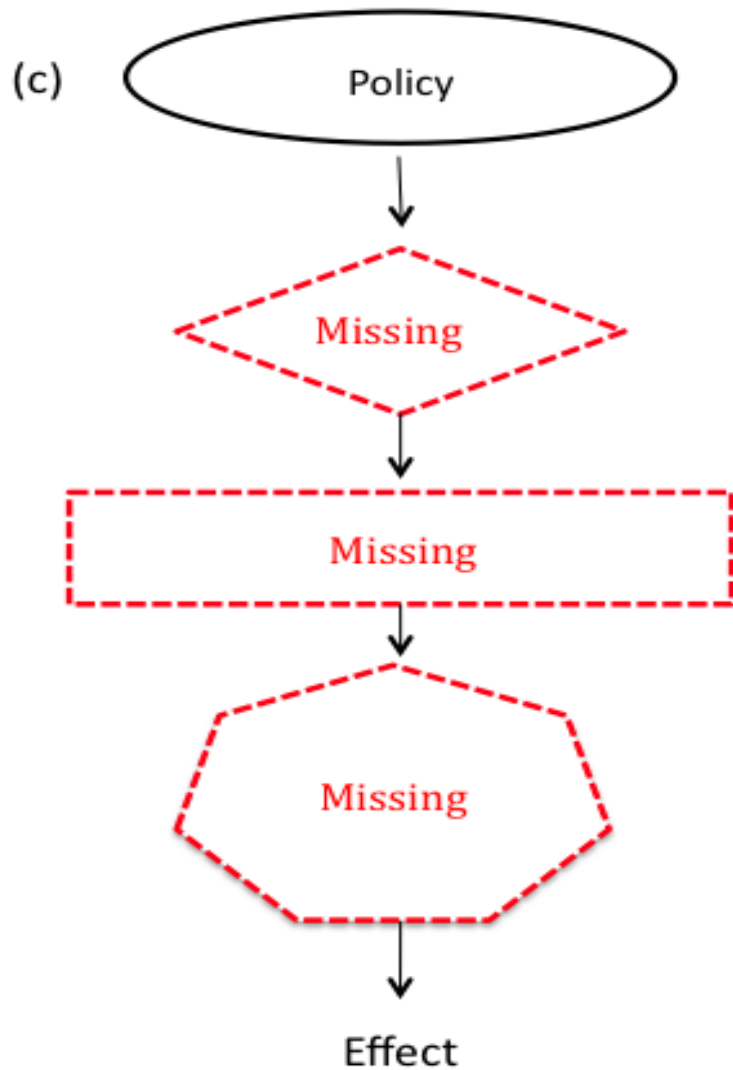
## Pathologies of instruments (1)





# Background to S&T policy instruments

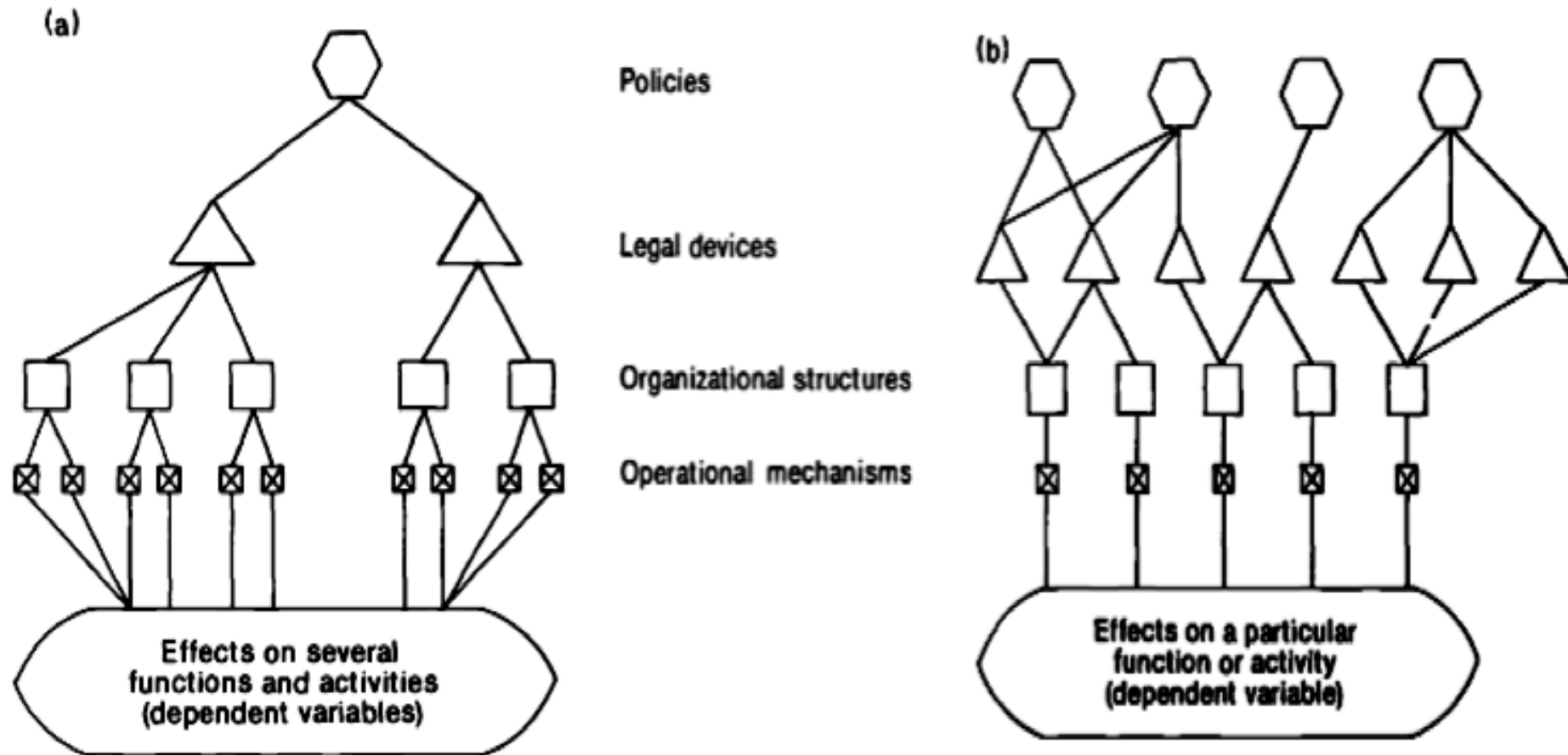
## Pathologies of instruments (2)





# Background to S&T policy instruments

## Clusters of a Policy Instruments



(a): Policy-oriented cluster of instruments (top-down).  
(b): Function-oriented cluster of instruments (bottom-up)



# Background to S&T policy instruments

Categories of S&T policy instruments (one of many classifications)

- Domestic supply of knowledge and technology: instruments to *build S&T capacities and infrastructure*
- External supply of knowledge and technology: instruments to *regulate technology imports*
- Pattern of demand for technology: instruments to *shape technological behavior* and ST&I performance of firms
- *Support for S&T activities* in private firms and public agencies



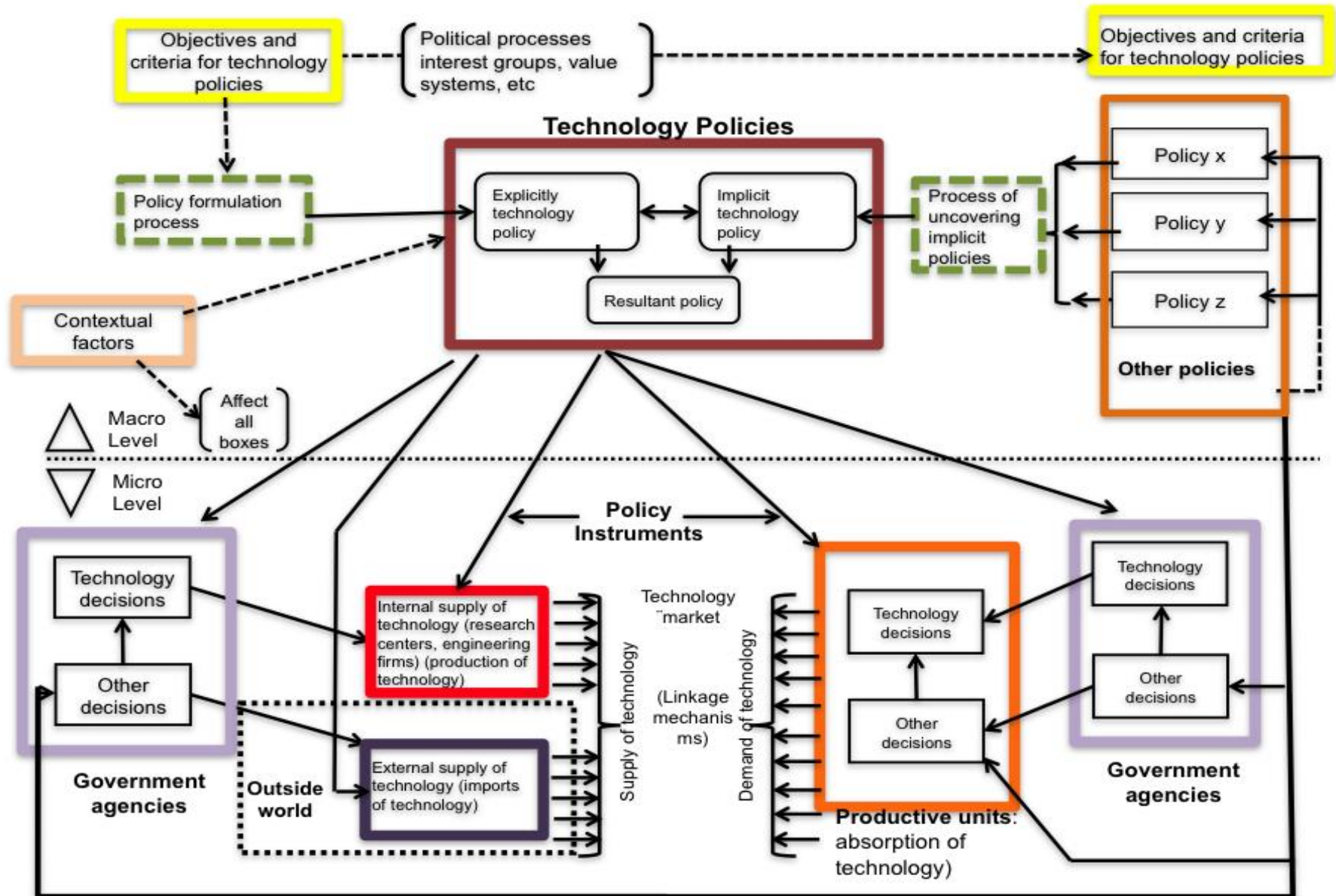
# Background to S&T policy instruments

S&T policy instruments, decisions and actors

- *Explicit* and *implicit* policies
- *Policy instruments*
- *Demand* for technology by private firms and public institutions
- *Domestic supply* of knowledge and technology (research and development)
- *External supply* of knowledge and technology (technology transfer)
- *Regulation and support* of S&T activities through public agencies



# Background to S&T policy instruments





# Background to S&T policy instruments

## Criteria for evaluating the performance of S&T policy instruments

- *Scope and specificity* (categories of decisions it affects)
- *Coverage* (types and numbers of agents influenced)
- *Efficiency* (amount of information, managerial demands, cost/benefit ratios)
- *Effectiveness* (impact on the actual behavior of agents)
- *Time lags* (time it takes to produce effect, vintages)
- *Flexibility* (capacity to adapt and evolve over time)



# Background to S&T policy instruments

Aggregate characterization of policy instruments in the STPI project

- *Generality* (decisions to influence not clearly defined)
- *Heterogeneity* (different vintages of instruments)
- *Passivity* (waiting for reactions of agents)
- *Redundancy* (overlapping instruments)
- *Incompleteness* (pathologies of instruments)
- *Formalism* (emphasis of policy statements and legal devices)



# Background to S&T policy instruments

Adequacy of array of policy instruments

- *Categories of developing countries* (according to their S&T Capacity Index)
- *Identification of policy instruments* pertinent to the different types of countries
- *Assessment of time frame* for relevance of specific instruments
- *Strategy: design of a sequence of policy interventions* and policy instruments
- *Information on experience* of other countries and regions (GO-SPIN and others)



# Background to S&T policy instruments

		Countries S&T Capacities		
Policies	Policy Instruments	Medium	Medium Low	Low
Supply-side measures for building science and technology infrastructure	Institution Building	++	++	+++
	Financing science and technology activities	+++	++	++
	Human resources development	++	+++	+++
	Science and technology priorities and plans	+	+++	++
	Networks of science and technology institutions	++	+++	++



# **Data on Science, Technology and Innovation Policy Instruments**



# Data on ST&I policy instruments

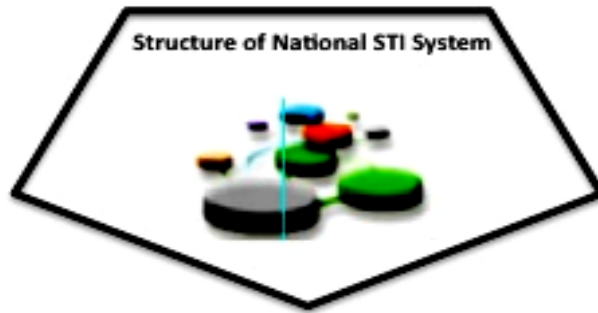
## Initiatives under way

- RYCYT (pioneering effort)
- ECLA (systematic assessment, teaching)
- ERAWATCH (large scope, comprehensive)
- **UNESCO's GO-SPIN**
  - Objectives:
    - Laboratory of ideas
    - Standard-setter
    - Clearing house
    - Capacity-building
    - Catalyst for international cooperation



# Data on ST&I policy instruments

## STI Policy Instruments



### Categories

1. Decision-Making Level
2. Promotion Level (funding)
3. Implementation Level
4. Evaluation Level

### Inventory

Institutions links and description of major programmes

The organization chart is presented in a normalized way allowing the possibility of designing a "topological metrics" in order to measure the degree of complexity of each NSTI system and eventually derive from them new policy indicators.



1. National Laws and Acts
2. National Decrees
3. National Regulations
4. International Agreements

Access to complete texts



1. Organized by Objectives and Strategic Goals
2. Organized by Type of Mechanism of facility
3. Organized by Type of Beneficiary

Classified in 9 different categories/ list of instruments

Classified in 11 different categories/ list of instruments

Classified in 18 different categories/ list of instruments

Each individual STI Policy Instruments is analyzed using the same 12 different dimensions in order to make them comparable. Later on they are classified by objectives and goals type of mechanisms and type of beneficiary



# Data on ST&I policy instruments

Implications for data gathering efforts (1):

- Need to *harmonize and coordinate* definitions and classification schemes
- Importance of expanding coverage to obtain data on a *diversity of country situations*
- Essential to ensure *continuity* of data gathering activities
- Importance of ensuring *ease of access* to information on ST&I policy instruments: role of *technology platforms*



# Data on ST&I policy instruments

Implications for data gathering efforts

- *Presentation formats* need to be carefully devised to facilitate interpretation
- *Aggregate assessments of situation regarding ST&I policy instruments would be useful*
- *Training programs* are required for those in charge of data gathering
- *International collaboration* is essential: role of UNESCO and other international organizations



# **Interpreting information and data on ST&I policy instruments**



# Interpreting data on ST&I policy instruments

How to *interpret and use information* on ST&I policy instruments?

- Need to avoid:
  - *Information glut* and *data avalanche* (too much material)
  - *Complexity* and *confusion* (excessive demands on policy makers)
  - *Mimetic transfer* (“it worked there, it will work here”)
  - *Mistaking correlation for causality* (sequencing)
  - *Ignoring policy inertias* (success, failure, aversions)



# Interpreting data on ST&I policy instruments

Guidelines for using information on ST&I policy instruments:

- *Always consider context* (reinterpret data in new policy environment)
- *State clearly importance of leadership* (highlight need for political commitment)
- *Do not underestimate administrative requirements* (managing operational instruments)
- *Assess behavior of key agents* (motivations, incentives, biases)
- *State clearly implementation lags* (balance deployment and impact times)
- *Establish monitoring and evaluation systems*



# Interpreting data on ST&I policy instruments

	Evolution of S&T policies in Latin America				
<i>Lines of thought on science, technology and development</i>	Science push (1950-mid 1960s)	Regulation of technology transfer (1970s)	Science and Technology policy instruments (1970s-mid 1980s)	Economic adjustment and market forces (1980s-1990s)	Competitiveness and Innovation systems (2000s-2010s)
<i>Role of S&amp;T in development efforts</i>	Scientific advances are the basis for development	Technology is a commodity, negative impact of indiscriminate imports	Development should be reinterpreted as capacity to generate knowledge and technology	S&T are not important in themselves, market forces are sufficient	S&T innovation is the key to economic and social development
<i>Factors that condition S&amp;T capacities</i>	Research capacity in universities and research institutions	Adequate regulation of technology imports, improved negotiation capacities	Supply and demand of technology, policy instruments, alignment of explicit and implicit policies	Neutral economic policies, avoid market distortions (don't pick winners)	Balance between private initiatives and state intervention, production policies, promote entrepreneurship
<i>S&amp;T interactions, policies and strategies</i>	Scientific research leads to technology and production (linear model)	Regulation of technology import creates demand for local S&T capacities	Interactions between elements of S&T system are key for policy design	S&T strategies and policies unnecessary, market forces are enough	Active, market-friendly policies and international insertion (liberalization)
<i>Role of international agencies in S&amp;T policies</i>	Cooperation in higher education and scientific research (UNESCO, IADB, OAS)	Joint actions to regulate technology imports (UNCTAD, Andean Pact)	Comparative studies on S&T policy implementation (IDRC, IADB, ECLA, ILO)	Diffusion of liberalization policies, "Washington Consensus" (World Bank, IMF, IADB)	Dissemination of good practices in innovation and competitiveness (IADB, OECD, UNESCO, World Bank)



# Research on ST&I policy instruments



# Research on ST&I policy instruments:

- Changing context for ST&I effort requires *continuous efforts to assess pertinence and effectiveness of ST&I policies*
- We do not have the luxury of doing research on ST&I after the fact: *need to accompany policy design and implementation*
- *Data and information are essential* for research and improved understanding
- GO-SPIN and other information and data gathering *require parallel research activities*



# Concluding remarks

- Reviewed background on science, technology and innovation policies ( STPI project)
- Looked briefly at information gathering efforts, interpretation of data on policy instruments and underscored need for research
- Potential of GO-SPIN as useful tool
- Critical importance of ST&I capabilities to bridge knowledge divide
- Need for research on ST&I policy design and implementation