

# Innovation Systems and Innovation Policies. An Introduction to the Logic of Evaluation

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# Outline

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1. Introduction: Why evaluate?
2. From Science and Technology Policies to Innovation Policies: Introductory Remarks
3. Innovation Policies
4. How Useful is Evaluation?
5. Problems and Issues in Evaluation Research.
6. Typology of Evaluation Studies
7. The Main Structure of Ex-Post Policy Evaluation Research
8. Four Types of Ex-Post Evaluation Research
9. Concluding remarks

# Why Evaluate?

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- Evaluation important in context of learning and feedback in policy making
- The Evaluation Cycle:
  - ❖ Problem Identification
  - ❖ Policy Formulation
  - ❖ Policy Implementation
  - ❖ Evaluation
  - ❖ Feedback and Learning
- Two Questions
  - ❖ Effectiveness. Do innovation policies work?
  - ❖ What can we learn from past experiences

# Innovation

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- Innovation: application of knowledge in production
- Process by which firms create and use knowledge to master and implement the design, development and production of products and services that are new to them, irrespective of whether they are new to their competitors, their countries or the world
- innovation close relationship with diffusion of knowledge and technology
- Innovation can be radical or incremental
- Based on research, but also on tacit knowledge and experiential learning. Not linear.
- Combines knowledge from many different fields such as science, engineering, management and marketing

# Why is Innovation Important for Advanced and Developing Economies?

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- Key driver of long-run growth in modern growth theories. Technological change is the endogenous result of effort and investment. Technological change is entwined with all other sources of growth, such as labour or capital.
- Increased knowledge intensity of production across all sectors from 'high tech' to 'traditional', in services as well as manufacturing or agriculture.
- Knowledge intensive production relies on a wide range of knowledge bases
- Growing use of knowledge appropriation strategies such as patenting
- Global diffusion of innovation based competition through deregulation of markets and trade liberalisation
- Innovation based competition requires closer linkages between knowledge producers and users to catch up and keep up as competitive conditions change. This means that innovation becomes more and more systemic.

# Innovation and Catch Up

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- Investment in knowledge different from investment in human and physical capital: non-rival and non-excludable. Knowledge diffuses and spills over (externalities).
- Advanced economies profit more from investment in knowledge than backward economies. More local spillovers, increasing returns to scale for capital and knowledge due to better innovation systems. Investment in knowledge leads to shifting the frontiers of knowledge and economic divergence.
- Production of knowledge (R&D , patents) primarily takes place in the technologically leading countries. This contributes to divergence and global inequality.
- But knowledge also flows internationally. International technology diffusion and spillovers can result in convergence and catch up if developing countries can tap into global knowledge flows.
- Technologically backward economies can profit from advantages of backwardness (Gerschenkron).

# Innovation and Catch Up, continued

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- Changes in technological paradigms create new opportunities for catch up.
- Profiting from international technology diffusion and technology spillovers is not easy. It depends on technological capabilities, social capabilities, technological congruence and absorptive capacities.
- Differences in absorptive capabilities determine the difference between success and failure in development.
- If catch up takes place, it is very rapid and dynamic.
- In a developing country context, the focus of innovation policy is to increase the absorptive capacity of the economy.
- Catch up or falling behind depends on the balance between technological forces making for divergence and technological forces making for catch up.

# From Science and Technology Policy to Innovation Policy

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- Positive externalities are the key theoretical rationale for all science, technology and innovative policies.
- Linear view: basic science – applied science – market introduction of new products and processes.
- Linear view: focus on the supply side: universities, research institutions, numbers of scientists, engineers, publications, patents.
- This has gradually been replaced by a systemic view (Innovation Systems, Lundvall, Nelson).

# Systemic View: Innovation Systems

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- Feedback mechanisms, circular loops
- Applied research, demand pressures from customers, shopfloor learning can result in scientific advance
- importance of interaction: networks of suppliers, customers, consumers, competitors, universities, knowledge organisations
- emphasis on the uptake and use of knowledge, rather than production of knowledge (knowledge flows)
- dynamic learning mechanisms
- Complementarity of many factors: functioning of markets, framework conditions, standards, incentives, policies, demand conditions, consumer preferences
- Sectoral specificity: sectoral systems of innovation
- The better the innovation system, the more rapid the flow of knowledge within the economy and the absorption of knowledge from outside.
- Rather than focusing on supply of knowledge and technology, the innovation system is built up around the innovative entrepreneurial actors.
- Emphasis on incentives and conditions for learning. Link with evaluation

# Innovation Policy Instruments

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- R&D subsidies
- R&D tax incentives, fiscal policies
- Policies with regard to venture capital
- Policies with regard to FDI
- National and international IPR policies
- Research grants
- Incubator policies/science park policies
- Incentives for high-tech production
- Cluster policies
- Educational policies
- Policies aimed at strengthening regional systems of innovation
- Policies aimed at strengthening sectoral systems of innovation
- Public procurement programmes

# Evaluation

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- Learning from evaluation important for improving quality and effectiveness of innovation policies
- The core of evaluation: experimental design, controlling for all factors except the treatment or target variable.
- Variety of methods
  - ❖ laboratory experiments
  - ❖ Quasi experiments with field research and control groups
  - ❖ Econometric models
  - ❖ Input-Output models
  - ❖ Simulation models
  - ❖ Multi-criteria studies
  - ❖ Feasibility studies
- Danger of evaluation as a bureaucratic ritual

# Reasons for Ineffectiveness of Evaluation

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1. Gap between evaluators and practitioners
2. Interests and interest groups influence outcomes
3. Often no ex ante evaluation, no clear statement of goals and targets of policies
4. Timeliness: deadlines result in quick and dirty evaluations
5. Limited absorptive and learning capacity of organisations
6. Policy makers' need for unambiguous results. If results are ambiguous - they often are -, they tend to be ignored

# Some Problems and Issues in Evaluation

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Doing good evaluation studies is difficult. A great many problems have to be tackled

1. No single well-developed evaluation methodology. Among others choice between: Before-after or with-without
2. Problems of data availability and costs of data collection
3. Choice of time span for evaluation; sustainability of the impact of the policy
4. Policy environment. Even very well designed instruments programmes cannot work in a poor policy environment (cf. Melzer, 2000).
5. Fungibility. Financial resources are 'fungible'. The marginal projects or activities that a subsidy, tax incentive or loan makes possible are often not the activities that are being evaluated.

# Typology of Evaluation Research

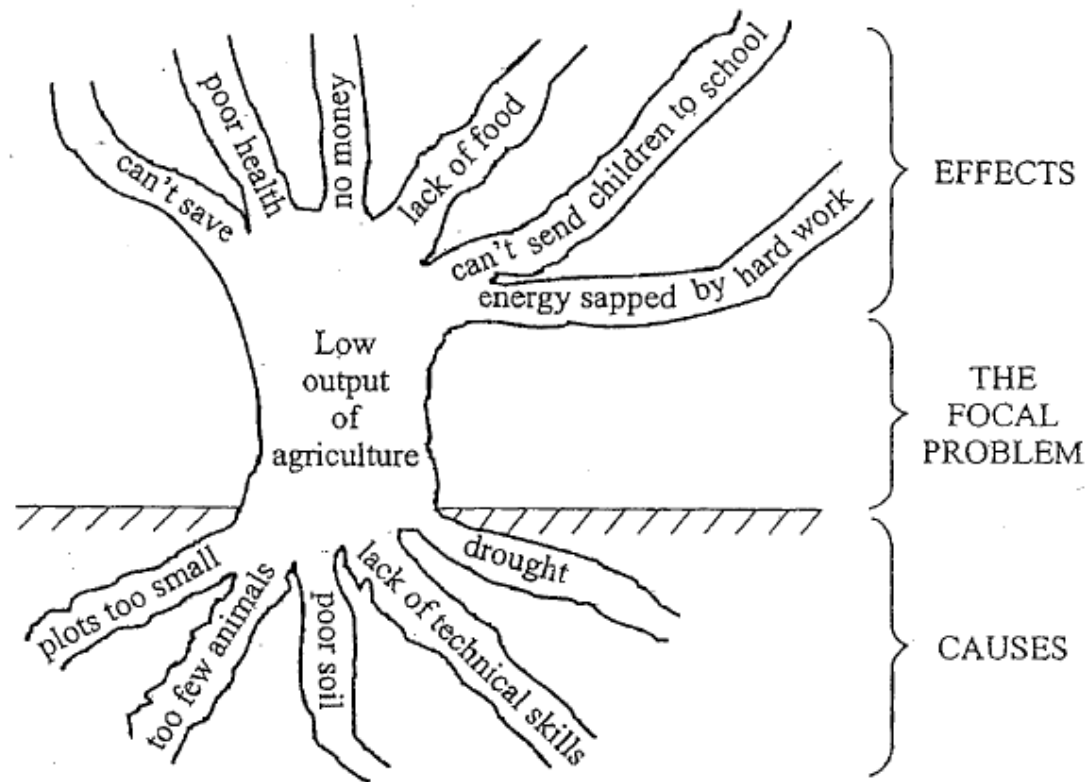
Characteristics	Ex ante	Monitoring	Ex post (& Ex interim)
Goal	Effects (feasibility) of a future policy	Continuous adjustment of goals and means	Assessing consequences (success/failure) of policies that have been executed (in full or in phases), for the target group or society as a whole. Deriving lessons for future policy design
Focus	Financial and technical aspects	Monitoring progress (financial, technical, organisational)	Multidisciplinary and multi-aspect
Timing	During policy formulation and planning	During policy implementation	After implementation of project or policy, or after implementation of a phase of a project or Policy
Execution	Mixed team (mission) of external and internal staff	Team of internal staff members	Mixed team (mission) of external and internal Staff
Orientation	Prospective (predictive, future oriented)	Retrospective and prospective	Retrospective and prospective

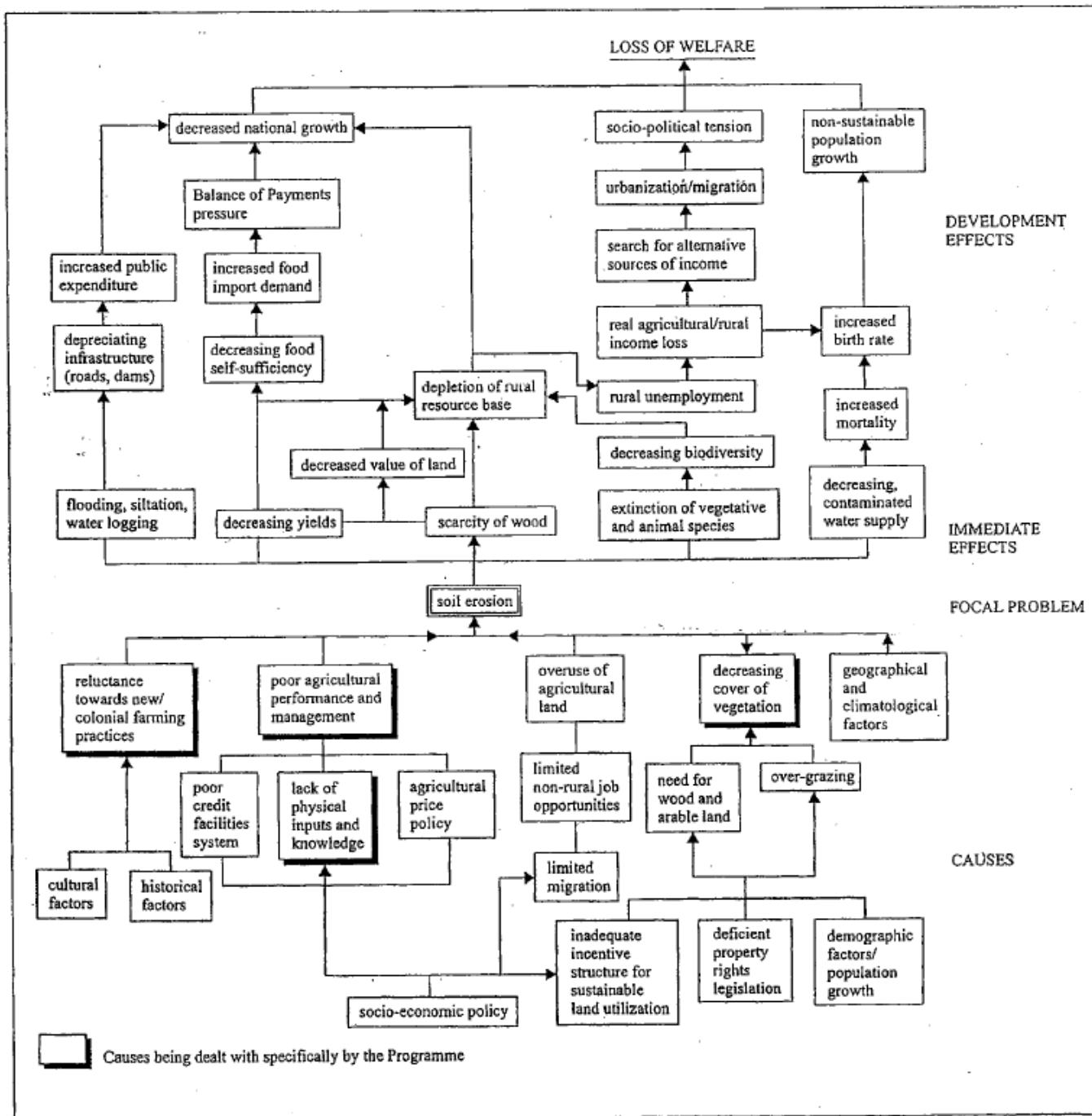
# Structure of Ex-Post Policy Evaluation Research

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1. Problem definition, goals and target groups: What are the goals, what is the target population, what are the policy instruments?
2. Problem tree and logical framework. Originally developed for policy design now used for evaluation
3. Logical framework: analysis of focal problem, root causes and consequences.

# Problem Tree: Example from Agriculture





# Logical Framework

<i>Narrative Summary</i>	<i>Objectively Verifiable Indicators</i>	<i>Measurement/ operationalisation (Means of Verification)</i>	<i>Risks and Assumptions in moving from level to level</i>
<b>Goals</b>			
<b>Immediate objectives:</b> .. ..	<b>End of Programme Status</b> .. ..		
<b>Project Outputs</b> 1 2 . . n			
<b>Activities</b>	<b>Inputs:</b> Quantities    Monetary Values		
1 2 . . n			

# Advantages of Logical Framework

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- Clear Statement of objectives
- Clarity about differences between outputs and objectives, e.g.
  - ❖ output: number of firms receiving a treatment
  - ❖ objective: increased innovativeness of treated firms
  - ❖ goal: increased competitiveness of economy
- Defining indicators
- Focus on measurement
- Thinking about assumptions concerning relationships between levels

# Initial Goals and Target Groups of a Policy May Be Vague and Unspecified

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- Before starting, evaluators will have to
1. Reconstruct of problem definition, goals and target groups
  2. Reconstruct of hierarchy of goals. Hierarchy of goals may show inconsistencies
    - lower food prices creates disincentive effects
    - support for target group may crowd out other actors
  3. Reconstruct hierarchy of target groups. Every policy has a wider target group in mind, but also an immediate target group of firms that are actual beneficiaries of a policy

# Central Questions in Ex-Post Evaluation

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1. Which policy instruments used?
2. To what extent are goals realised due to use of instruments?
3. What conclusion is reached with regard to instruments:
  - failure, discontinue activities
  - success: continue
  - continue in changed form

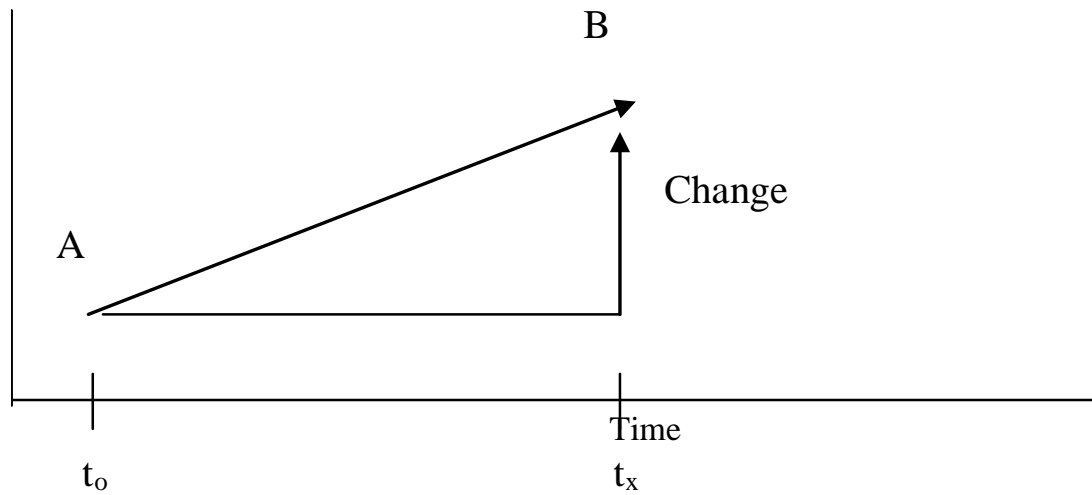
Result of evaluation: recommendations

# A Typology of Ex-Post Evaluations

Specified targets	Before – after	With – without
No specified targets or expectations	A. Situation research	B. Effect research
Specified targets or expectations	C. Goal realisation research	D. Effectivity research

# Situation Research

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- A: Initial condition at time 0
- B. Situation at time of evaluation x

# Information Required for Situation Research

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## **Required Information**

Changes in the situation before and after the policy or project

- Side effects, positive or negative
- Costs of policy (average costs, marginal costs, overhead costs).
- Bottlenecks in organisation and project

**Conclusions about project or policy depend on the balance between**

Changes in the situation, plus positive side effects

And

Negative side effects, costs and bottlenecks.

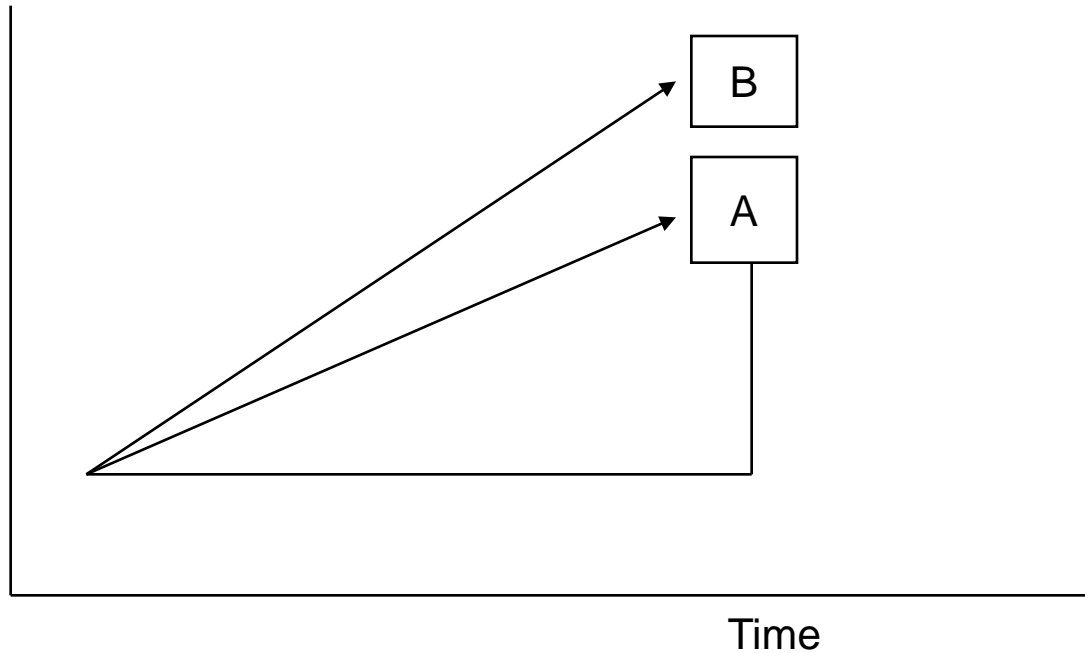
Problem: absence of counterfactual

# Characteristic Problems of Situation Research

	Practical problems	Methods
1	Which changes are taken into account?	
2	Assessment of impact of instruments or activities	Theoretical analysis or discussions with practitioners
3	How to quantify qualitative Aspects	Use of quantitative Indicators
4	Reliability of information	
5	Defining measurement points in advance	Include measurement in programme design
6	Defining measurement points in retrospect	Use of time series
7	What policy costs to be taken into account	
8	Dealing with Inflation	Use of appropriate deflators

# Goal Realisation Research (Quantified policy targets)

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A: Actual situation at time of evaluation

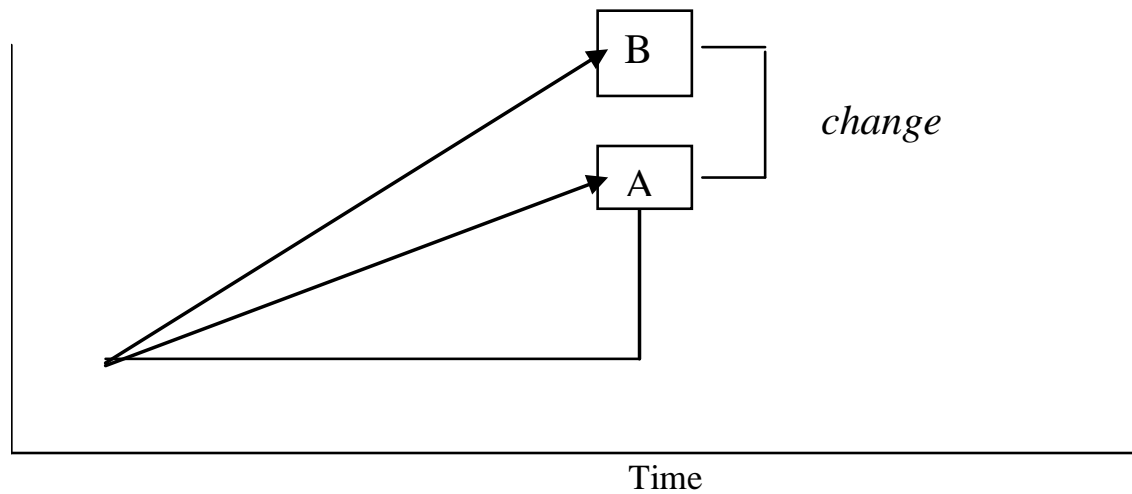
B: Desired (target situation) at time of evaluation

# Typical Problems of Goal Realisation Research

	Problems	Methods
1	Determine goals of policy or organisation	Document research, interviews with clients and stakeholders, construct hierarchy of goals
2	Quantify qualitative goals	Develop quantitative indicators: financial or specific
3	Assess impact of Policy instrument	determine alternative explanations of observed changes in theory or practice
4	Reliability of information	Depends on data collection methods

# Effect Research

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A: Base line scenario

B: Actual situation at time x after policy implementation

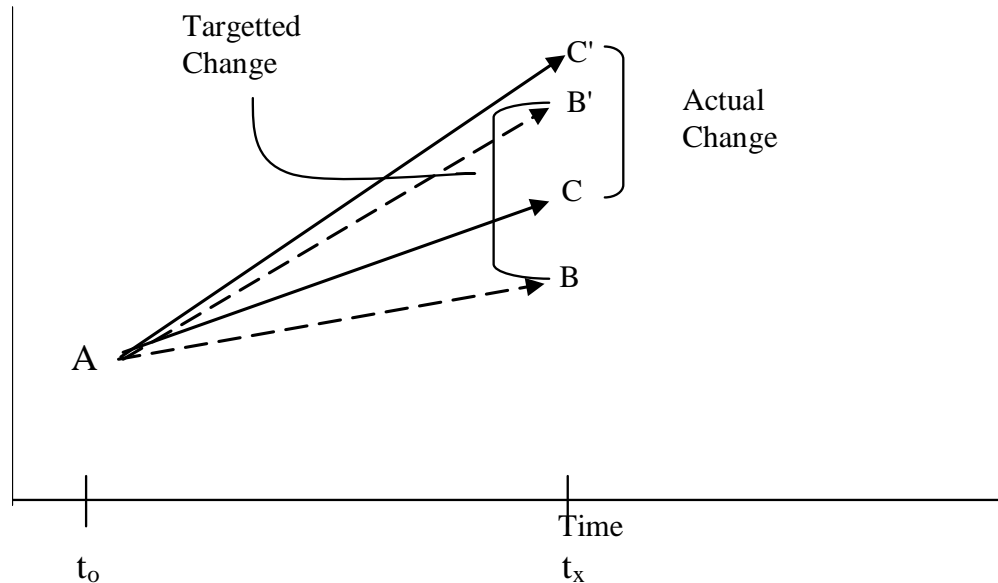
# Problems of Effect Research

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	Problems	Methods
1	Isolating influence of instrument	Trend extrapolation; classical experiment, quasi-experiment, modelling
2	Difficult to assess the base line scenario	Need for external expertise
3	High costs of evaluation	

# Effectivity Research

With-Without plus Specified targets



A initial situation

AB predicted base line scenario

AB' predicted scenario after policy implementation

AC actual base line scenario

AC' actual scenario after policy implementation

Compare the targeted (desired) change with the actual change.

# Choice between Approaches

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Depends on

- Complexity of problem. E.g. If problem complexity is low before after evaluation may be sufficient
- Demands of client organisation
- Costs of evaluation process

# Operationalisation, Data Collection and Research Methods

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Once the choice for the type of evaluation has been made, one needs to

- operationalise the key variables.  
Translation of targets into measurable indicators
- decide on data collection methods
- decide on method of evaluation

# Example of Operationalisation of Employment Targets

Aspect	Components	subcomponents	subcomponents	indicators
Employment Effects	Direct employment Effects	Direct employment creation		Number of new persons employed in 2000
		Direct employment destruction		Number of persons fired in 2000
	Indirect employment Effects	Indirect employment creation	Backward indirect employment creation	Number of new employees in local subcontracting firms
			Forward indirect employment creation	Number of new employees in local downstream firms
		Indirect employment destruction	Backward indirect employment destruction	Number of fired employees in local subcontracting firms
			Forward indirect employment destruction	Number of fired employees in local downstream firms

# Data Collection

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- Secondary data
  - ❖ Survey data: innovation surveys, industrial surveys, R&D surveys
  - ❖ Use of policy documentation and policy data collections: e.g. data on subsidies given, numbers of recipients of tax relief.
- Primary data collection
  - ❖ Tailored surveys
  - ❖ Expert interviews
  - ❖ In depth case studies
  - ❖ Observations
- Experiments

# Choice of Evaluation Method

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- a. Pure Experiment
- b. Modelling. Simulation or econometric modelling
- c. Multicriteria methods: important. Based on weighting objectives.
- d. Score card methods: multicriteria methods without weights.
- e. Feasibility studies ex post. Feasibility studies translate different criteria into financial figures, using market prices or shadow prices as weights.
- f. Qualitative assessments



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Thank you