

# **Impact assessment of EU policies**

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# Outline of presentation

- Impact assessment of EU policies – theory and principles
- Evaluation methodologies and techniques
- Ex ante impact assessment
- Real options approach: a brief methodology overview
- Econometric modelling and simulation
- Polish experience with modelling impact assessment
- Social impact indicators: indices of social development
- Impact dimensions of public RTD spending

# Impact assessment of EU policies – theory and principles

## Impact assessment and theorizing

- Impact analysis based on our understandings of technological change and market failures: we need models as a background for assessment exercise
- Appreciative vs theoretically founded models for impact assessment

## Objectives and targets

- Defining the objectives; multidimensional objectives (evaluation criteria); conflicting goals; in terms of portfolio resource constraint all goals are in conflict except for some synergies and complementarity
- Outputs: direct and indirect, tangible and intangible (learning, collaboration-networking)

## Economic considerations

- Impact as a function of budget size
- Society's production possibility frontier as instrument of evaluation

# Impact assessment of EU policies – theory and principles

## Rationale for policy intervention

- Additionality: crowding out or crowding in /input, output, behavioural/
- Evolutionary perspective: not only market failure of underinvestment, but failure in knowledge flows through networking and collaboration, institution building
- Publicly funded projects as a part of wider spectrum of activities / portfolio approach

## Practical relevance

- Diffusion orientation to bridge the gap of incapacity to transfer ideas to market and the European paradox
- Pre-competitiveness and near market nature of EU projects vs transfer problems
- EU level and cross-country impact differences; convergence and divergence in Europe vs diversity
- Continuity over subsequent programmes; time and space consistency

## Basic principle of methodology

- Counterfactual method: to compare the behaviour of the system with a variety of alternative outcomes - value only has meaning in comparison (H. Cameron, 2006), and the correct comparison is between '*actual outcomes*' and '*alternative outcomes*', a counterfactual perspective, not just comparing states of nature over the period of operation of a policy measure

# Evaluation methodologies and techniques

## 1. Assessment by experts (peer review)

- Traditional assessment method - peer evaluation: structured panels of independent experts
- Modified assessment method - modified peer review: including potential users

## 2. Interviews and questionnaires

- Questionnaire and surveys (participant appraisal, user appraisal): also useful for model calibrations, hypothesis testing and exploration of process and impacts
- Expert or review groups: including wider panels of eminent scientists with broad views and expertise for ex ante evaluation, feasibility study

## 3. Case-studies

- Outright case studies: a method of appreciative theorizing to understand complex processes and explore situations with interesting variables not predefined; a step to gradually build up a model (Max Weber's Verstehen methodology)
- Foresight: Delphi method of a structured survey of expert groups making use of the implicit knowledge of participants, with consensus reducing uncertainty
- Technology assessment: the anticipation of impacts and feedback concerning a given technology case

# Evaluation methodologies and techniques

## 4. Semi-quantitative methods

- Bibliometrics: bibliometric indicators, citation indices
- Patent analysis for measuring technological capacities of research and technology development institutions; knowledge spillovers and diffusion: e.g. PATSTAT
- Technometrics: analysis of scientific and technical indicators
- Analyses based on performance indicators: results for economy and society

## 5. Quantitative methods

- Cost-benefit analysis
- Economic surplus analysis
- Econometric models and simulations
- Real options approach

**6. Portfolio analysis:** from evaluation of institutions to evaluation of projects and portfolio; trade off between risk and return; covariances and substitutions between projects under maximisation of expected return, multidimensional approach to projects, consistency check of the whole portfolio

**Recommended:** a combination of multiple methods as no method in isolation can provide an optimal assessment; intangible character of output, dynamic effects and feedbacks; multidimensional objectives require the use of various methodologies and indicators.

# Ex ante impact assessment

- **Cost-benefit analysis** (quantitative with qualitative elements) not easily comparable across cases, good base for intervention efficiency assessment, subjectivity and assumptions sensitivity; cannibalization- externalities/spillover (project or economy-wide effects); investment appraisal; NPV preferable to IRR for comparability
- **Experts panel/peer review**: semi-quantitative, qualitative judgments, wide scope perspective, economic benefits not precisely captured; performance capabilities
- **Foresight**: consensus building to reduce uncertainty under different scenarios, technological capabilities and paradigm shifts
- **Technology assessment**; the anticipation of impacts and feedback in order to reduce the human and social cost of handling new technology; e.g. the US Office of Technology Assessment; agenda-building technology assessment
- **Quantitative modelling and simulation**: use of macroeconomic or microeconomic models and simulation techniques based on advanced mathematical and statistical tools
- **Real options approach**: based on branching theory of events, (alternative to risk premium manipulating for choosing the highest expected NPV in cost-benefit analysis); e.g. patents as real options
- **Portfolio approach**: Europe at the crossroads and European paradox; RTD vs CAP

# Real options approach: a brief methodology overview

- The cost of initial R&D as the price of a financial call option
- The cost of follow-up investment to capitalize on R&D project as the exercise price of financial option
- The stream of returns to the follow-up investment as the value of the underlying stock for a financial call option
- The downside risk measured by the value of initial investment limited (price of the option)
- Increasing uncertainty increases the value of the option (initial R&D project)
- The longer time framework increases the value of the option (compare to NPV )
- An abandonment value (salvage value when shutting down the project and redirecting resources to another project) as the exercise price of a put option
- NPV: inaccurate discount rates; problems solved partially by including risk analysis to NPV valuation (theoretically correct but computationally complex)
- Approximation of the underlying value by estimating the market potential deriving from the R&D outcome in question
- Approximated volatility (risk): technological, market, exogenous events ( a twin portfolio to derive it; if not by CAPM); opportunity cost made up of the risk-free rate of return and the risk premium for the riskiness of the project; NPV plus DTA: the sum of the conventional static NPV and the option premium consisting of the flexibility value and the strategic value

# Econometric modelling and simulation

## Types of macro-modelling

- **Neoknesian** macroeconomic (macroeconometric) models based on a set of econometrically estimated structural equations concerning the behavioural characteristics of agents: HERMES/HERMIT; INTERLINK; disequilibrium models without well-defined market clearing conditions; convenient to evolutionary modelling
- **Computable General Equilibrium** (CGE) models based on microeconomic foundations, a mix of input-output models with Walrasian perfect market clearing approach: IMF MULTIMOD, EU QUEST; simulating the effects of policy is a useful tool for economic impact analysis; theoretically sound and elegant but the calibration a sensitive and arbitrary process
- **Endogenous growth theory** (NGT) not yet completed (spillover scope. spillover theory of entrepreneur, knowledge production function, rational expectations)
- **Complementary approaches:** methodological convergence in modeling; use of complementary approach advisable
- **Macroeconomic models:** measuring policy impact on jobs, economic performance and growth; models with endogenous variables - instruments of evaluated policy; based on sound and robust economic theory with clear and well established casual relationships and feedbacks

# Econometric modelling and simulation

## Use of econometric models

- **Econometric models for productivity assessment** (TFP); so-called growth accounting based on neoclassical production functions (CD, CES); production function econometrics
- **Knowledge spillovers studies** measuring impact of various sources of R&D capital on TFP: Bayoumi, Coe /Multimod/(1999), Eaton, Kortum (1007), W. Keller (1997), Guellec, van Pottelsberghe (1997)
- **Macroeconomic evaluations** of Community Structural Funds (CSF) QUEST II: suitable to model supply-side effects of infrastructure and human capital investments
- **Microeconomic evaluation** models (basically ex post): to quantify the impact of the public policy schemes (single instruments) on the level of supported unit (counterfactual comparison); models usually based on panel data regression analysis; especially for assessment of technology transfer programmes (e.g. when subsidized)
- **Technology gap approach:** diffusion based models of policy impacts; suitable for accession countries; Cappelen, Castellacci, Fagerberg, Vespagen (2002), *The Impact of Regional Support on Growth and Convergence in the European Union in 1989-1999*: positive and increasing impact but asymmetrically skewed due to absorption barriers (effects stronger in more developed environments) and unfavourable industrial structure; straightforward policy recommendations.

# Polish experience with modelling impact assessment

- **Model HERMIN:** a modification of HERMES model: four-sector neokeynesian model with built in supply-side elements; applied for evaluation of CSF for Polish economy in the EU financial perspective 2004-2006; also applied for assessment of regional support in 16 Polish regions both for ex ante and ex post evaluations, then used for impact assessment of the new financial perspective instruments 2007-2013
- **Model MaMoR:** CGE model elaborated by IBNGR Warsaw, 2006: designed to assess the impacts of CSF on national development performance indicators (GDP, consumption, investment, exports and imports, employment, labour productivity, wages and prices, infrastructure, human and physical capital) at the national and regional level of 16 regions in 2004-2007, as well as the convergence programme; neoclassical assumptions of CES production function with three production factors (labour, human capital, and physical capital)
- **EUImpactMod:** Dynamic Stochastic General Equilibrium Model DSGE, developed by IBS Warsaw, 2009, as a large-scale macroeconomic structural model including expectations under uncertainty: designed to study impacts of EU cohesion policies on macroeconomic indicators 2004-2006 and 2007-2013, at the national and regional level; the model has an extensively elaborated budgetary and fiscal segment of the economy in order to trace the effects of CSF flows on the economy.

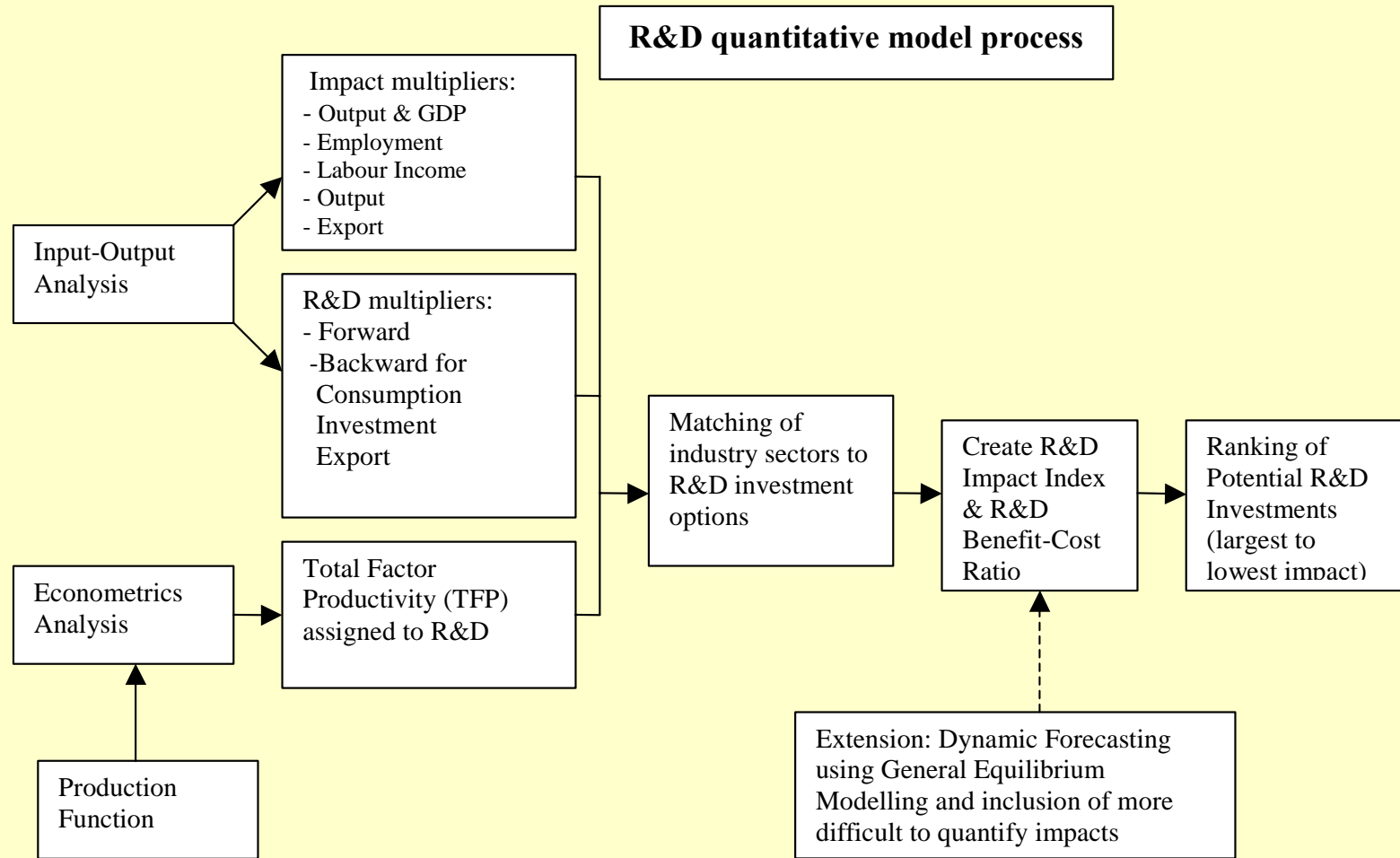
# Social impact indicators: indices of social development

- **HDI, Human development index** – (UNDP): a composite index combining indicators of healthy life (life expectancy), access to knowledge (education) and living standard (GDP)
- **QLI, Quality of Life Index** (EIU) available since 2005 – based on the survey on subjective life satisfaction combined with multivariate factor analysis to unveil the most important satisfaction determinants (health, well-being, political stability and security, family and community life, job security, political freedom and gender equality)
- **GINI Index**, the most widely used measure of inequality based on a covariance between the income/consumption of the individual/household and its rank in the whole distribution
- **GDI, Gender-related Development Index** – a composite index measuring the average achievements in human development (healthy life, access to knowledge, living standard) adjusted to account for inequalities between men and women
- **GEM, Gender Empowerment Measure** – a composite index measuring gender inequality in three basic dimensions of empowerment: economic participation, political participation, and power over economic resources
- **HPI, Human Poverty Index** – to measure the position of disadvantaged people in the society, in particular vulnerability to early death, exclusion from knowledge and communication, lack of access to adequate economic provisioning, social exclusion due to long-term unemployment
- **Civil liberties index**, *Freedom House*, survey-based.

# Impact dimensions of public RTD spending

Main domains of impact of public RTD spending	Direct impacts		Indirect impacts	
	Short-term	Long-term	Short-term	Long-term
<b>Science</b> Typical impacts	scientific findings	knowledge	improved teaching	industrial spill-overs
<b>Economy and society</b> Typical impacts	improved technology	improved technical know-how	increased productivity	improved competitiveness
<b>Policy</b> Typical impacts	improved understanding	problem-solving	increased problem awareness	increased general satisfaction

# Public R&D Investment Comparison and Performance Evaluation: An Input-Output-Econometric Framework



R&D economic impact assessment framework developed to meet Canada's National Research Council' (NRC) strategic planning and performance evaluation needs. Frederick Kijek, Reza Ghazal, January 2006