Ministry of Economic Affairs

Outline

✓ The Dutch policy impact assessment strategy: how do we do it?

✓ Using RCT's, natural experiments and advanced econometrics: a quick review

✓ Beyond econometrics: a bird's eye view

✓ Observations & conclusions

*"**Heroic policy making**:*
To live in a modern democracy is to be experimented on by policymakers from cradle to grave. Education is intended to mould an upstanding future citizen; a prison sentence, reshape someone who has gone astray. But without evidence, those setting policy for schools and prisons are little better than a doctor relying on leeches and bloodletting. Citizens, as much as patients, deserve to know that treatments they endure do actually work".

("In praise of human guinea pigs", *The Economist,* December 12th, 2015, p. 18)

On the (un)usefulness of econometrics for RTD policy impact assessment: Dutch experiences

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RTD policy evaluations workshop "Veranstaltung zu ökonometrie in de Evaluierung: Was können ökonometrische methode – was könne sie nicht?"
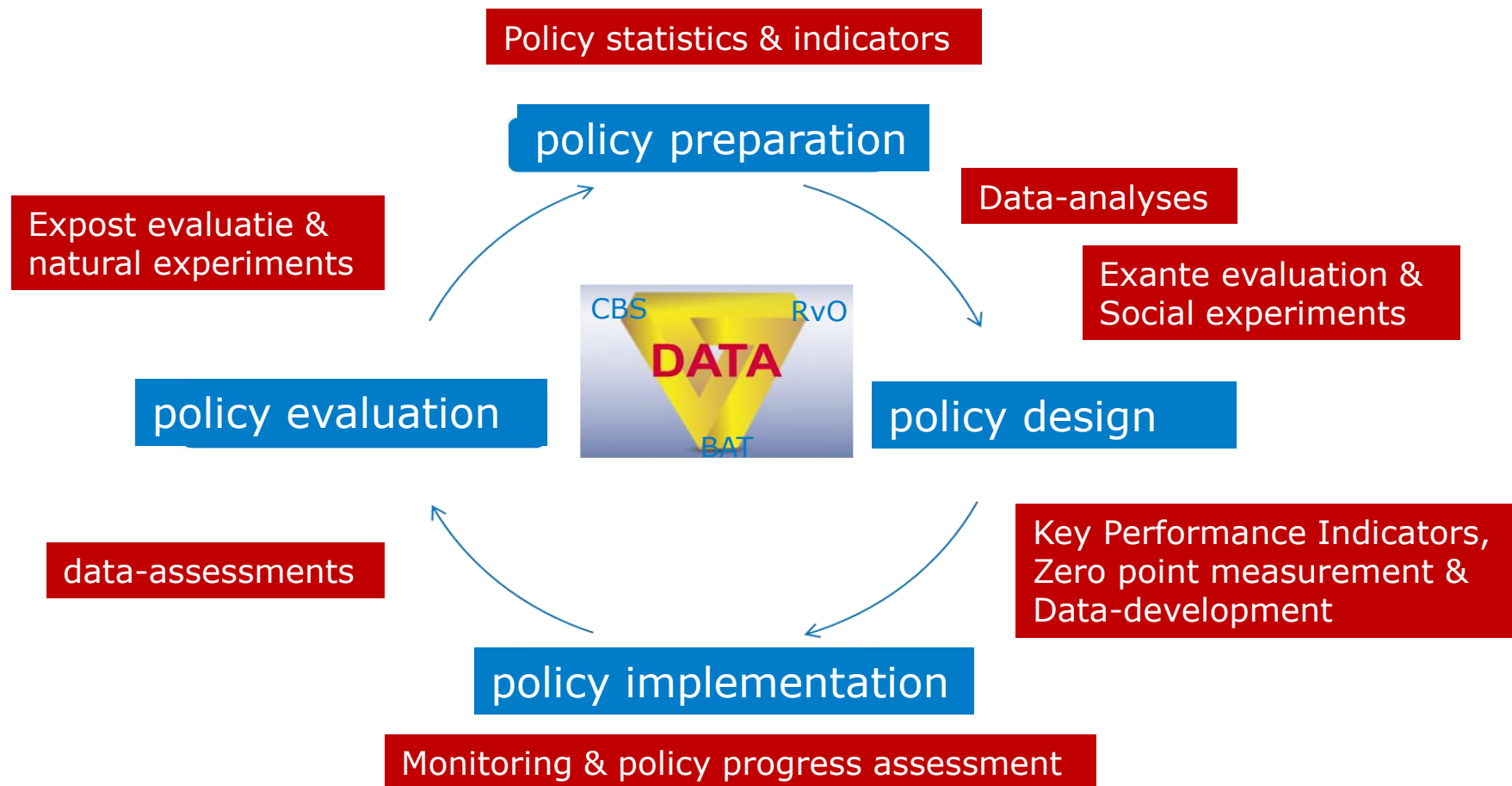
Austria Platform for R&T Policy Evaluation

Our Policy Impact Assessment Strategy

✓Developing a consistent Policy Intervention Theory.

✓Monitoring key performance indicators (macro, policy areas, sectors, institutions & interventions).

✓Evaluating policy instruments using state of the art (econometric) methodologies and data : ex post, ex ante and small scale policy experimentation, counterfactual & control groups, natural experiments using econometrics.

✓Investing in creating high quality (linked) micro-data sets and methodologies that can reveal causality.

Around the policy circle: data & analytics

Policy statistics & indicators

policy preparation

Data-analyses

Expost evaluatie &
natural experiments

Exante evaluation &
Social experiments

CBS   RvO

DATA

BAT

policy evaluation

policy design

Key Performance Indicators,
Zero point measurement &
Data-development

data-assessments

policy implementation

Monitoring & policy progress assessment

How do we do it?

Randomized controlled trials (RCT) using a lottery

✓ 1st best: social experiments using randomised control trails and difference-in-means estimates (ex ante evaluation), including "nudging"

✓ 2nd best: natural experiments using econometrics on (linked) micro-data (ex post evaluation): "regression discontinuity", "difference-in-difference", "propensity score matching"

✓ 3th best: advanced econometrics (no control group)

✓ 4th best: descriptive statistics and perceptions

In all cases: combining quantitative and qualitative methodologies and data

*Evaluation Quality = methodology * data^2*
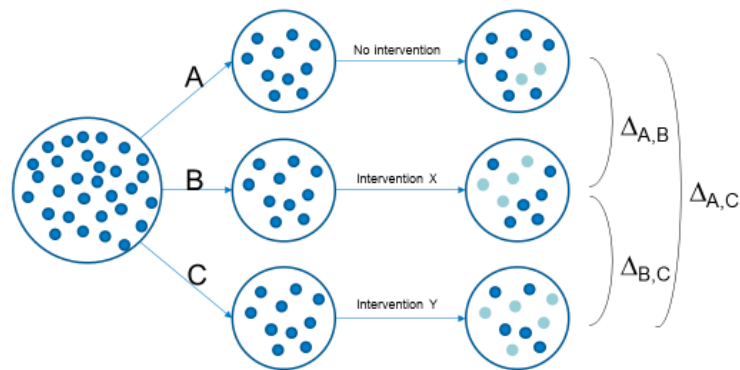
Some RTD-examples of what it delivers

- RCT: short & long term impact innovation vouchers scheme

- Natural experiments:
  - Innovation Credit
  - Innovation Box (profit based tax credit)
  - Applied Research Organisations
  - Eurostars
  - Technology Foundations
  - SBIR
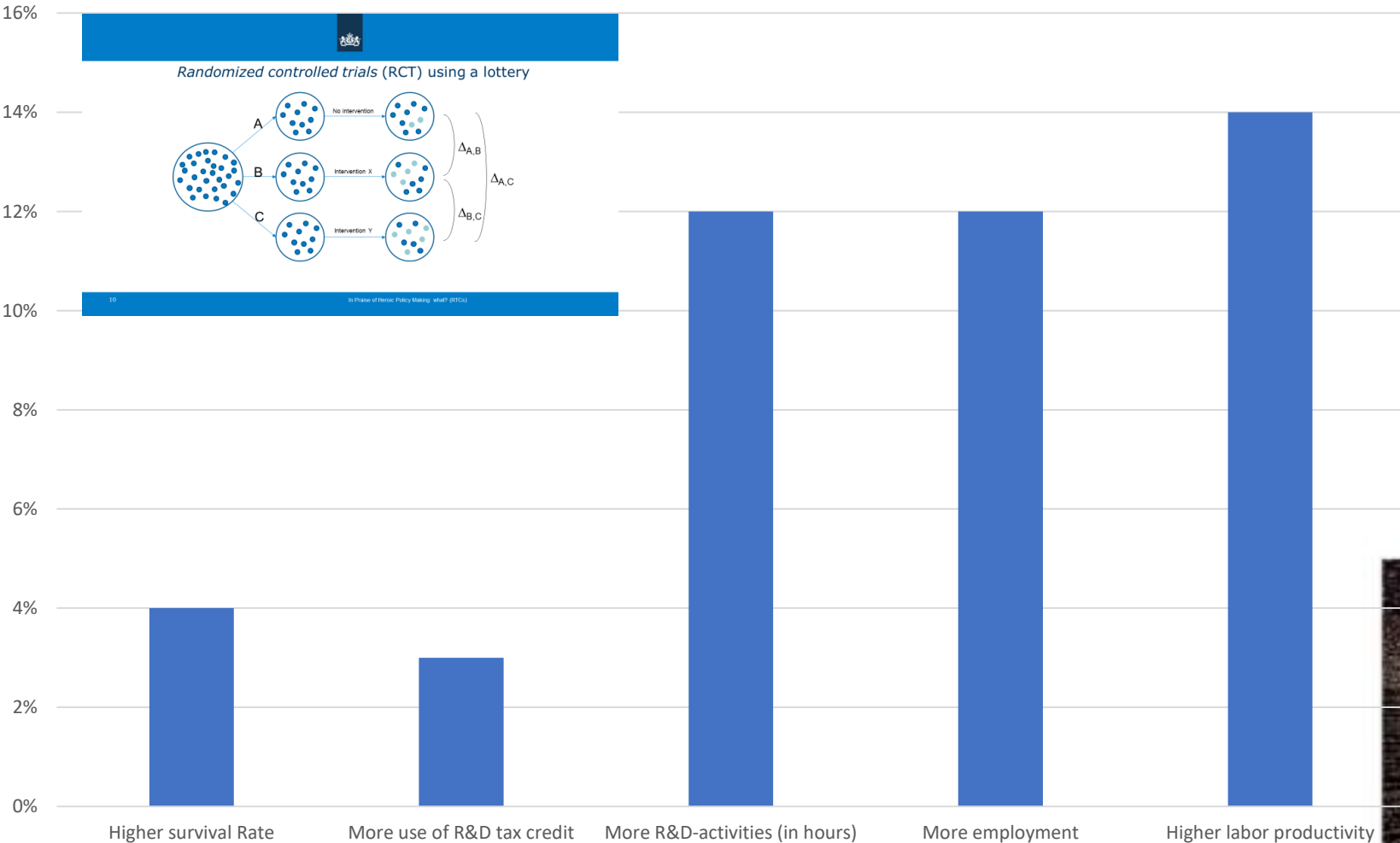 - WBSO (labour based tax credits)

Randomised Controlled Trials

Scheme / estimation period	Aim	Methodology	Results
Innovation vouchers, 2004-2005	More utilisation by SMEs of research performed by public knowledge institutes	- Estimation method: analysis of survey results on the basis of a linear probability model - Control group: non-selected applicants in a lottery procedure in 2004 (first round of allocation of innovation vouchers)	Positive effect on projects assigned to public knowledge institute. [Out of every ten vouchers, eight were used for a project that would not have been assigned to a knowledge institute, one was used for a project that would have been assigned anyhow, and one voucher was not used.]
Innovation vouchers, 2002-2017	More utilisation by SMEs of research performed by public knowledge institutes	- Estimation method: panel analysis (fixed effects included in robustness analysis) - Control group: non-selected applicants in lottery procedures during the years 2004-2005	- Positive effects in the short, medium and long tem on employment and the survival probability and in the long term also a positive effect on business R&D. - No effect found on labour productivity.
SME Innovation Stimulation Scheme Topsectors (MIT), consisting of various subschemes; 2012-2015	More research and innovation in SMEs, particularly in the context of the top sector approach	- Estimation method: fixed effects panel analysis, reflecting a difference-in-difference approach - Control group: non-selected applicants in lottery procedures during the years 2013-2015	- Positive effects on business R&D. - Effects on business performance not estimated.

Differences in long term performance between firms with or without innovation voucher (in %)

Randomized controlled trials (RCT) using a lottery

A — No intervention
B — Intervention X
C — Intervention Y

$\Delta_{A,B}$
$\Delta_{A,C}$
$\Delta_{B,C}$

In Praise of Heroic Policy Making: what? (RTCs)

Category	Value
Higher survival Rate	4%
More use of R&D tax credit	3%
More R&D-activities (in hours)	12%
More employment	12%
Higher labor productivity	14%

16%
14%
12%
10%
8%
6%
4%
2%
0%

The long-term impact of Dutch innovation vouchers: Back to the future with randomised controlled trials

By Theo Roelandt, Henry van der Wiel

Thursday, 30 January 2020.

Natural experiments (I)

Scheme and estimation period	Aim	Methodology	Results
<u>Experimental design: whether or not a grant/credit has been obtained</u> Innovation credit, 2006-2016	More high-risk development projects, aimed at new products and processes	- Estimation method: fixed effects panel analysis, reflecting a difference-in-difference approach. - Control groups: 1) rejected applicants and 2) as non-applicants a selection of WBSO users with on average similar characteristics as the treatment group of approved applicants	Positive effects on business R&D and business performance (particularly employment and survival probability; mixed results for effects on turnover)
Dutch participation in Eurostars, 2008-2019	More R&D and innovation, particularly in SMEs	- Estimation methods: difference-in difference and regression discontinity design (in the latter case: project review score as control variable) - Control groups: 1) rejected applicants and 2) selection of WBSO users based on propensity score matching	- Positive effect on business R&D - No effect found on business performance (turnover, employment and labour productivity)
Innovation box, 2008-2013	More business R&D and innovation and a better investment climate for R&D related business activity	- Estimation method:difference-in-difference and, as related approach, first difference. - Control group: WBSO users that did not use the Innovation box	- Positive effect on business R&D (BFTB: 0.54). - No significant effect on innovation perfomance, measured as turnover share of new and improved products. - Effects on further business performance (e.g. turnover, employment) not estimated

Natural experiments (II)

Scheme and estimation period	Aim	Methodology	Results
Experimental design: whether or not a grant/credit has been obtained			
Applied research organisations TO2: co-operation in R&D and innovation with firms, 2008-2018	More innovation	- Estimation method: fixed effects panel analysis, reflecting difference-in difference - Control groups: 1) WBSO users in general and 2) WBSO users based on propensity score matching	Positive effects on business performance (value added and employment) and also on business R&D
Small Business Innovation Research (SBIR), 2007-2015	More innovation, particularly in SMEs	- Estimation methods: difference-in difference and regression discontinuity design (in the latter case: project review score as control variable) - Control groups: 1) WBSO-users that did not apply for SBIR and 2) rejected applicants	- Mixed results for effects on business performance (turnover and employment) - Virtually no effect on business R&D
Technology Foundation STW, 1996-2011	More technical research in public institutes, to be utilised by firms	- Estimation methods: difference-in-difference, regression discontinuity design and 'fixed effects'/'random effects' panel analysis (project review scores as control variable in case of regression discontinuity design) - Control group: rejected applicants	- Positive effects on publication performance of researchers, measured by the number of publications and the number of public-private co-publications - Mixed results for effect on patent appllications

Natural experiments (III)

Scheme and estimation period	Aim	Methodolgy	Results
<u>Experimental design: impacts of policy developments vary among groups of firms, dependent on firm characteristics</u> WBSO (R&D tax scheme), crisis measures, 2007-2010 WBSO (R&D tax scheme), introduction of starters facility and extension of the first bracket of R&D expenditure, in which the tax credit rate is relatively high, 1994-2003	Mitigating the effect of the economic crisis on business R&D More business R&D	- Difference-in-difference - Control treatment groups: different groups of WBSO users - Difference-in-difference and, as related approach, first difference - Control and treatment groups: different groups of WBSO users	Positive effects on business R&D Positive effects on business R&D

Traditional regressions: advanced econometrics

Scheme and estimation period	Aim	Method	Results
WBSO (R&D tax scheme), 2011-2017	More business R&D	Estimation method: fixed effects panel analysis, including instrumental variables in order to control for dependence of the WBSO tax credit rate on the amount of R&D expenditure ('synthetic user cost of R&D' approach) Sample: WBSO users; no control group	Positive effects on business R&D; BFTB on R&D wage expenditure: 0,90 (effect on total R&D expenditure not estimated because of data limitations) Furthermore: positive effects of business R&D on innovation performance (turnover share of new and improved products) and business performance (labour productivity)

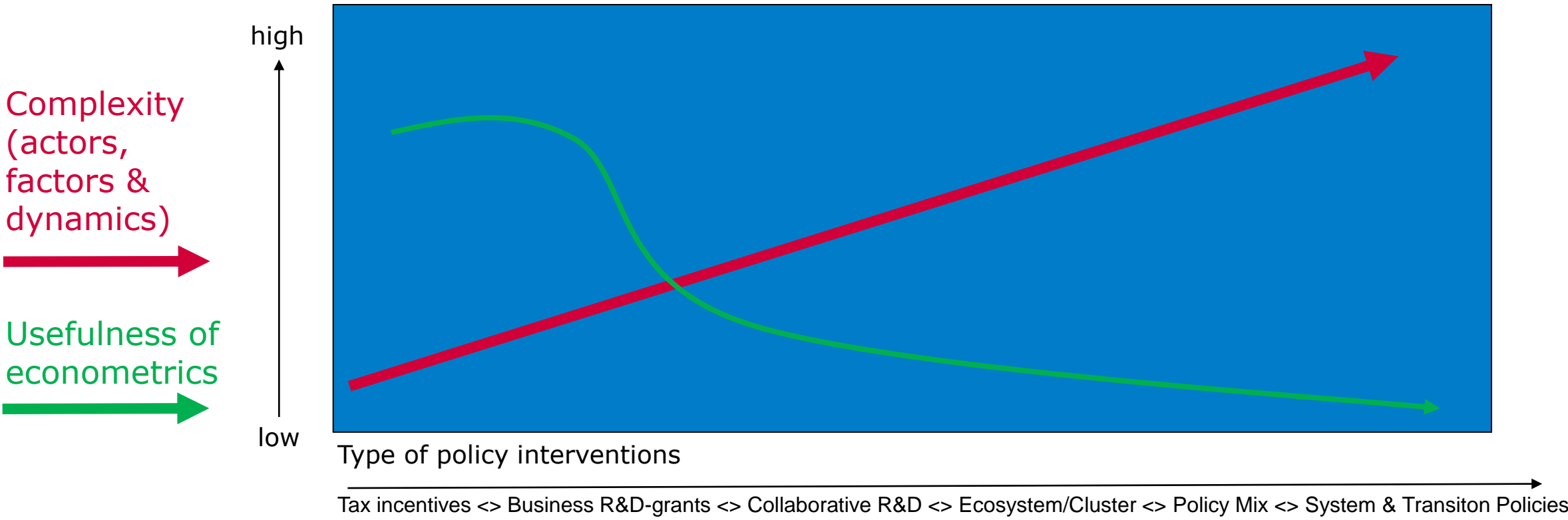# The (un)usefulness of econometrics in policy evaluation

Very usefull indeed:

- more inside in what works and what doesn't in "single agent policy instruments" (one actor, one measurable target, financial of character).

- Provides hard evidence on policy impact: additionality, effectiveness & "bang for the buck". Depoliticise the policy debate with facts. More "bang for the buck" from tax payers' money.

- It encouraged to make more work of data-development and policy monitoring, right from the start of new policy initiatives.

But not in all cases:

- Most modern policies are more than "single agent" instruments (transformative, systematic, multi-actors, complex policy mixes and interactions): econometrics doesn't help much

- E.g. mission oriented innovation policy, industry carbon reduction policies, digitalisation policies.

- Call for new methods and data and "theory of change-methodologies".

Evaluation: complexity, policy interventions & the use of econometrics

Complexity (actors, factors & dynamics) →

Usefulness of econometrics →

high

low

Type of policy interventions

Tax incentives <> Business R&D-grants <> Collaborative R&D <> Ecosystem/Cluster <> Policy Mix <> System & Transiton Policies

# A new evaluation framework for systemic & transformative policies?

✓ Internationally, evaluation techniques still in its infancy. No Gold Standard available.

✓ Therefore, Dialogic i.c.w. Harvard Kennedy School for Public Policy developed a new framework
  ✓ See Janssen (2016): What bangs for your bucks?, CID-paper no 69.

✓ Transformative policies like TSA are about adapting socio-economic systems to open opportunities for a set of new technologies

✓ The framework assesses how much policy contributed to changes or transitions in these technological innovations systems (TIS)

Systemic Evaluation Framework: bird's eye view
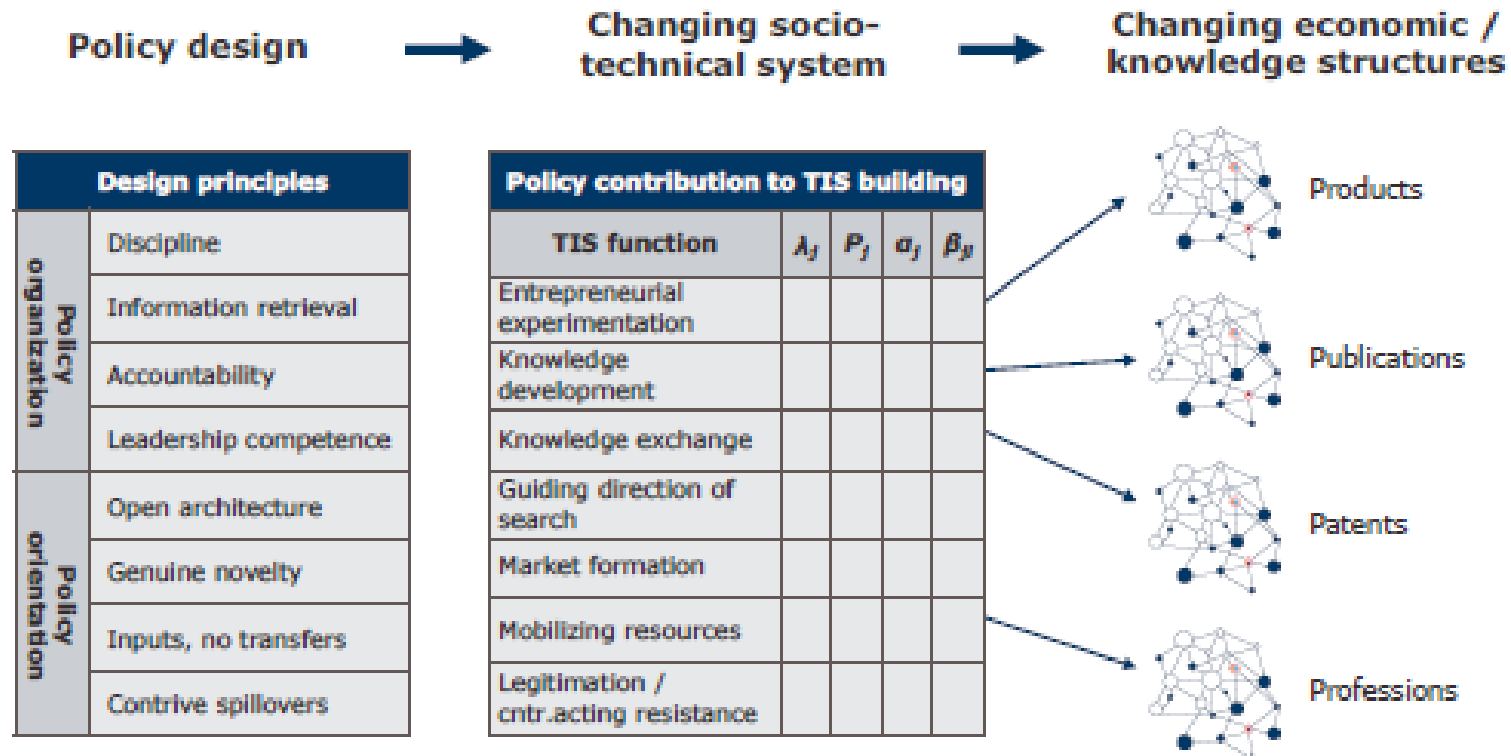
What bangs for your buck?
Assessing the design and impact
of Dutch transformative policy

Matthijs J. Janssen [a, b]

Highlights
• Transformative policy is selective, process-oriented and multi-instrumental.
• We develop a framework for assessing transformative policy design and impact.
• We apply the framework to evaluate the Dutch Topsector approach.
• The Topsector approach adheres to many of the design principles for transformative policy.
• Impact mostly consists of engaging private parties in fortifying existing knowledge networks.

It delivers another kind of insight on policy impact

✓ TSA seems to be effective (i.e. more public private partnership) and efficient (i.e. social benefits > social costs)

✓ TSA improved the innovation system

✓ Observations/dilemma's
  ✓ Structural changes take time to occur
  ✓ Differences between top sectors depending on state of technology and quality of the innovation system
  ✓ Bottom up versus top down => role of government in setting goals?

✓ Improvements in policy design of TSA => next phase more focus on societal challenges and goals

Wrapping up & discussion

- Evalu$ation\ Quality = methodology * data^2$

- Econometrics helps policy makers to know the causal impact for "single agent instruments" and it helps increasing the quality and impact of public expenditures.

- Transformative & systemic policies and complex policy mixes demand for new methodologies. Internationally still in its infancy.

- In the Netherlands: a new "evaluation experts committee" installed developing new methodologies, next to the econometric tool box available. Will bring its advice in the Summer 2021.

- "Don't trow out the baby with the bathwater!": use econometrics where it can and is usefull, but develop and adopt at the same time new methodologies for transformative and systemic policy mixes. Combine quantitative & qualitative methodologies.