THE ECONOMIC AND SOCIAL IMPACT OF ICTs: WHY IS DATA ANALYSIS IMPORTANT?

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ITU ICT Regulatory Tracker Index

- Regulatory authority
- Regulatory mandate
- Regulatory regime
- Competition framework

An increase of 1% in the Regulatory Tracker Index yields a positive increase in the Digital Index of 0.0348% in the subsequent time period

Source: Katz, R. and Callorda, F. The economic contribution of broadband, digitization and ICT regulation, ITU Thematics

CAF Digital Ecosystem Development Index

- Digital infrastructure
- Digital connectivity
- Household digitization
- Digitization of production
- Digital competitive intensity
- Digital industries development
- Digital factors of prorduction

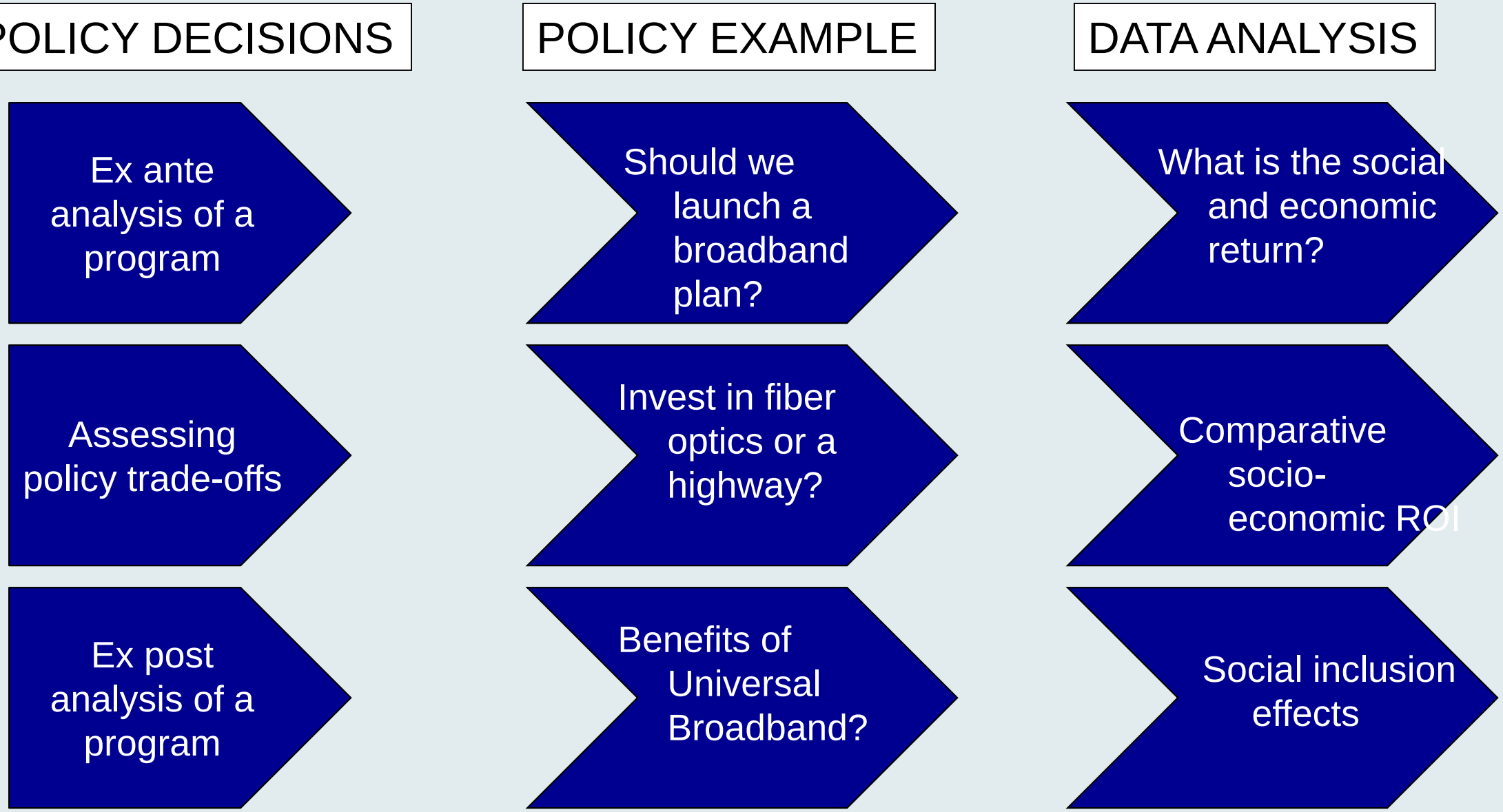
Therefore, ICT Policy matters!

The issue is not whether ICT adds value, but how to apply it

IF POLICY IS CRITICAL IN DRIVING DIGITIZATION DEVELOPMENT, HOW DO ENSURE THE FORMULATION OF RIGHT POLICIES?

- Data analysis is a critical component of ICT policy
- Importance of data analysis research designs
- Risks of data analysis
- A way forward

DATA ANALYSIS SUPPORTS SEVERAL TYPES OF ICT POLICY DECISIONS



UNFORTUNATELY MANY POLICY MAKERS REACH DECISIONS BY ONLY IMITATING THE EXPERIENCES OF OTHER COUNTRIES, ADOPTING A "HERD" BEHAVIOR

Countries may bypass rigorous data analysis to generate evidence in support of policies

POLICY IMITATION RATIONALE

- **Reduction of uncertainty**
- **Promote reputation**
- **Cost of information**
- **Learning from opinion leaders**
- **Policy competition**
- **Role of the policy leading countries and organizations**
- **Role of "policy entrepreneurs"**

POLICY IMITATION THAT BYPASSES DATA ANALYSIS IS NOT A RANDOM PROCESS – IT FOLLOWS ONE OF THREE MODELS

POLICY DIFFUSION MODELS	RATIONALE
Geographic proximity	If the neighboring country has previously adopted a certain policy, this approach might be suited to address the needs of our country because both nations share similar needs and challenges (“copy your neighbor”)
Lateral diffusion	If two countries share a social, economic, political, and cultural background, it is highly likely that they will adopt the same policy or regulatory framework
Hierarchical diffusion	Regulatory models are developed in the most advanced or large countries, and are then adopted by successively less advanced or smaller nations

DECISION MAKING POLICY SHORTCUTS THAT AVOID RESEARCH AND DATA ANALYSIS ARE DANGEROUS

- Despite geographic proximity or membership of a common community, **no two countries share the same social, economic and cultural conditions**
- **Implementing a policy because a leading country has done it before is no policy**; only builds some credibility in the short run
- **Benchmarks** are useful to understand differences in performance; they are **no standardized templates for formulating policy**

DATA ANALYSIS FORMS THE EMPIRICAL EVIDENCE REQUIRED TO MAKE POLICY DECISIONS

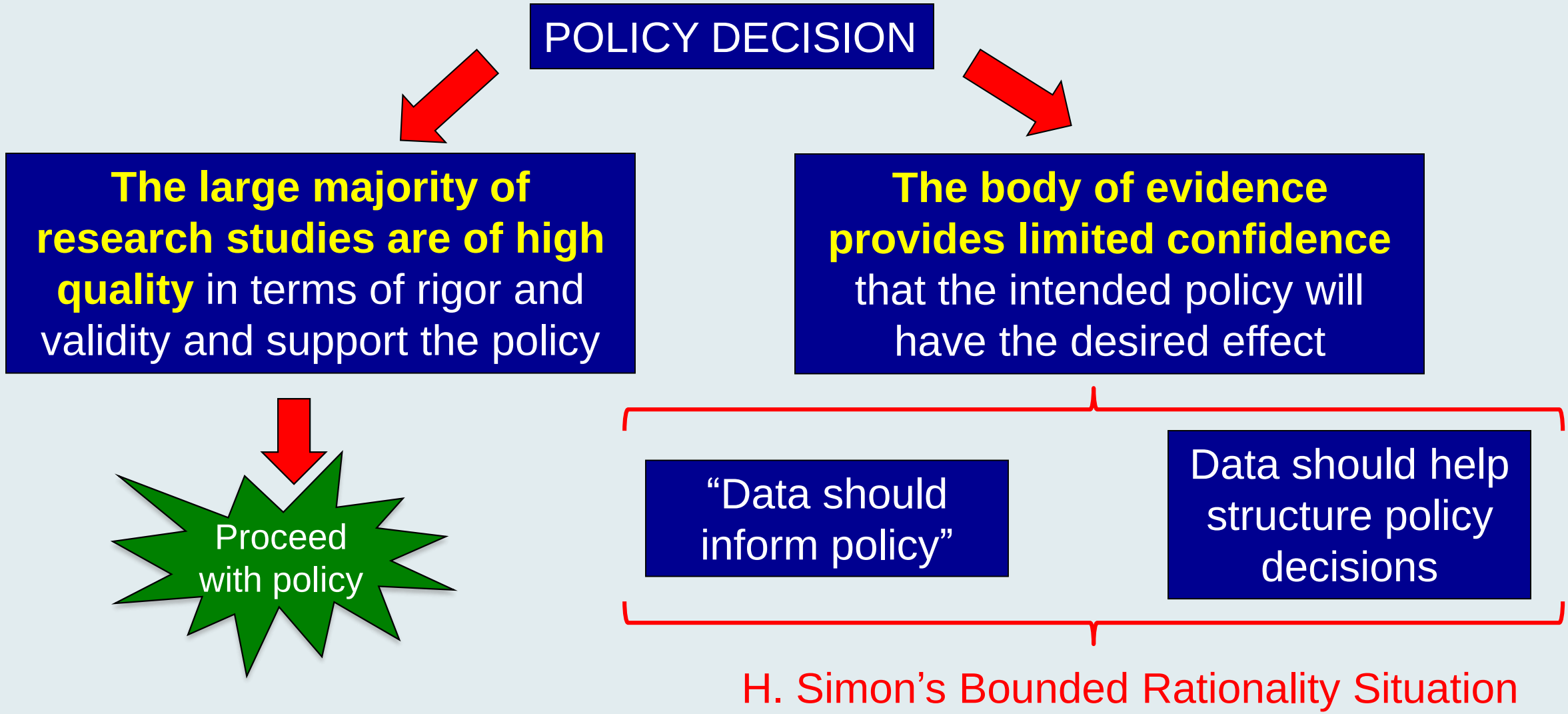
POLICY EXAMPLE	DATA ANALYSIS
Should we launch a broadband plan?	What is the social and economic return?
Invest in Fiber optics or a highway?	Comparative socio-economic ROI
Benefits of Universal Broadband?	Social inclusion effects

EXAMPLE OF EVIDENCE STUDIES

- Econometric analysis of impact of digitization on economic growth
- Effect of broadband service adoption on household impact
- Impact of broadband penetration on productivity
- Impact of broadband adoption on accesss to public services (health care, education)

EVIDENCE DIMENSIONS	ASSESSMENT PRINCIPLES
Technical quality	• Transparent methodology • Analytical rigor • Validity of models and data used • Certainty about causality of impact • Consistency of results
Size of evidence	• Number of studies supporting the evidence • Consistent studies in terms of measurement and results
Consistency of findings	• Consistency of study circumstances (time when studies are conducted, population, etc.) • Degree that different studies point to similar conclusions

IN LIGHT OF THE HIGH QUALITY STANDARDS OF EMPIRICAL EVIDENCE, POLICY MAKERS TYPICALLY FACE TWO ALTERNATIVES



AGENDA

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APPROACHES TO DEAL WITH CAUSAL ANALYSIS

ANALYTICAL DIFFERENCES

Explore causality

- Attempts to understand whether there is any type of causal relationship
- Example: what are the potential effects of broadband deployment on innovation?

Demonstrate causality

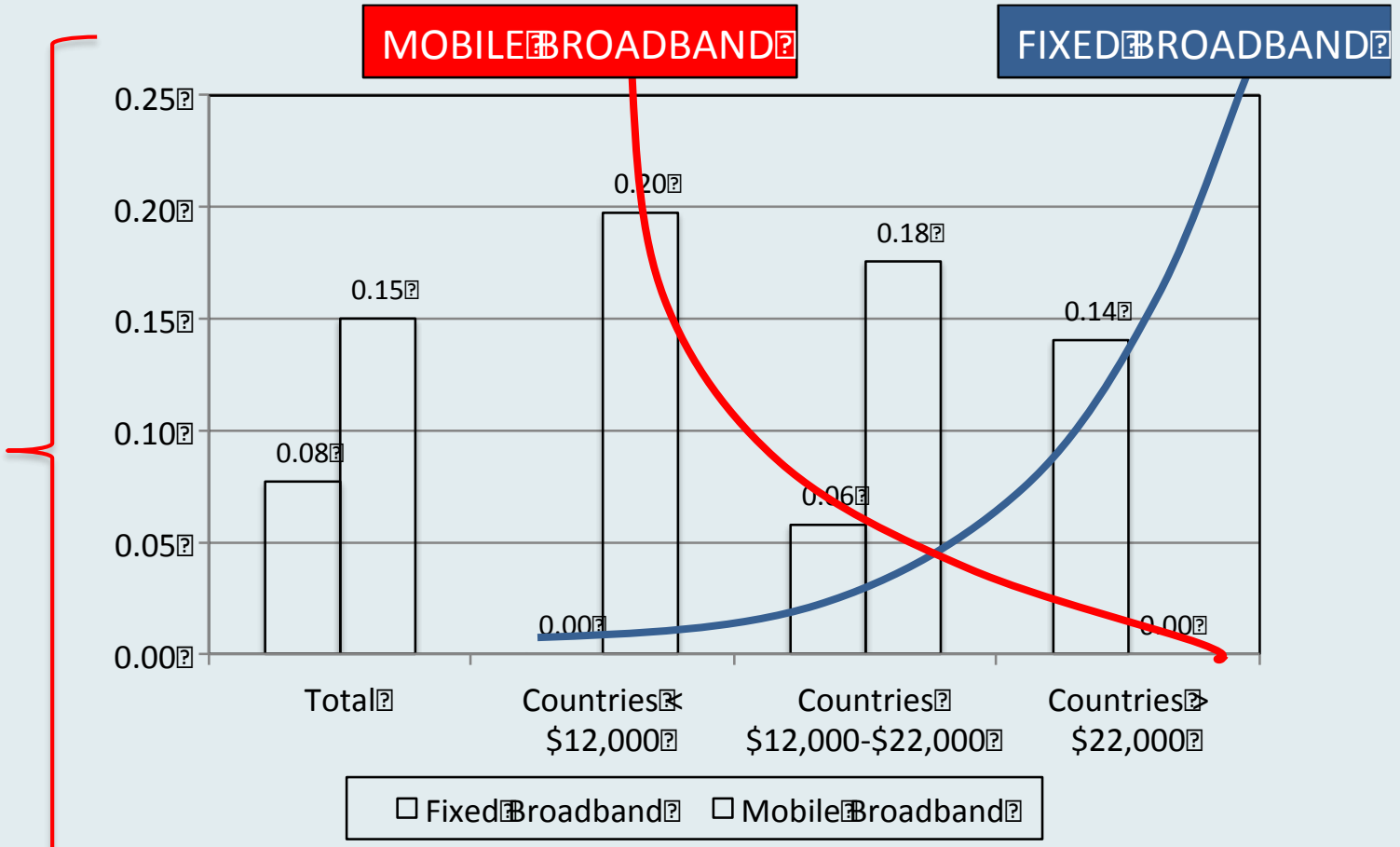
- We hypothesize that causality exists but have not found evidence to support this
- Example: Broadband triggers economic growth

Explain causality

- We know causality exists but we do not know what the mechanisms are
- Example: why is it that broadband availability increases household income?

- Single variable regression (with fixed effects)
- Multiple variable regression (with controls and fixed effects)
- Use of Instrumental Variables
- Structural models (used in most of our studies of economic effects of broadband)

GDP GROWTH IMPACT OF 1% BROADBAND PENETRATION INCREASE



Source: Katz, R. and Callorda, F. The economic contribution of broadband, digitization and ICT

ECONOMETRIC ANALYSIS IS OF USE IN MEASURING THE IMPACT OF ICT AT A MACRO LEVEL (E.G. ECONOMIC GROWTH OF A COUNTRY OR REGION)

- Single variable regression (with fixed effects)
- Multiple variable regression (with controls and fixed effects)
- Use of Instrumental Variables
- Structural models (used in most of our studies of economic effects of broadband)

ADVANTAGES

- No ideological bias
- Allows understanding of past relationships to predict future policy impacts

DISADVANTAGES

- Endogeneity (addressed through either instrumental variables or structural models)
- Given rapid technological change, future policy impact might differ from evidence of past research
- All observations are treated equally without differentiating national specificities (**which requires a country-specific analysis**)

EXPERIMENTAL RESEARCH IS USEFUL TO MEASURE THE IMPACT OF ICT ON A SPECIFIC POPULATION (E.G. DOES BROADBAND CONTRIBUTE TO AN INCREASE IN HOUSEHOLD INCOME?)

- Approach focuses on "effects" defined by experiments
- Developed in opposition to economic models – causal effects can be defined only if an experiment can be performed affecting a group of subjects ("treatment") versus a "control" group
- Causality is proven by counterfactuals

$$Y_i = \alpha + \gamma Treatment_i + \beta Controls_i + u_i + fixed\ efects_i + e_i$$

- Broadband deployment yields an increase in annual income level of 3.67%
- In household has a computer, the annual income increase from broadband deployment is 3.92%
- If household was accessing the Internet via dial-up, the annual income increase from broadband deployment is 5.01%

Source: Katz, . and Callorda, F. The economic contribution of broadband in Ecuador, DIRSI/IDRC, 2014.

EXPERIMENTAL RESEARCH IS VERY USEFUL TO MEASURE THE IMPACT OF ICT ON A SPECIFIC POPULATION (E.G. DOES BROADBAND CONTRIBUTE TO AN INCREASE IN HOUSEHOLD INCOME?)

- Approach focuses on "effects" defined by experiments as the objects of interest
- Developed in opposition to economic models – causal effects can be defined only if an experiment can be performed affecting a group of subjects ("treatment") versus a "control" group
- Causality is proven by counterfactuals

ADVANTAGES

- Controls for selection bias
- Construction of counterfactual (what happens if we do not deploy broadband?)

DISADVANTAGES

- Few countries have microdata needed to conduct this type of analysis
- Complexity in building a treatment and a control group

OTHER TECHNIQUES THAT RELY ON PRIOR STUDIES CAN ALSO BE USEFUL IN GENERATING SUPPORTING POLICY EVIDENCE

ALTERNATIVE APPROACHES	CHARACTERISTICS	ADVANTAGES/DISADVANTAGES
Research literature review	• **Systematic review of existing studies** in support of the intended policy understanding different methodologies and highlighting differences and coincident results	• Advantages: represents a robust, high quality technique for evidence synthesis; might reduce the cost of conducting new research • Risks: a cursory review, non-systematic review might bias evidence
Meta-analysis	• Statistical analysis **combining results of a large collection of studies** to increase statistical significance or fill in a data gap	• Advantages: improve estimates of the size of a particular effect; understand trends in areas with missing data • Risks: data/methodology inconsistency could result in biased conclusions

QUALITY DIMENSIONS	KEY QUESTIONS
Theoretical framework	• Is the study guided by a conceptual and theoretical framework? • Is there a link between the theoretical framework and the data analysis?
Transparency	• Can the study be replicated? • Are design and methodologies open to other researchers?
Validity	• Measurement validity: are indicators the right ones to measure the phenomenon? • Internal validity: causality, reverse causality • Is analysis based on country data? • External validity: can the study be replicated?
Results	• Identify effects vs. evidence of no effects vs. no evidence for an effect

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Numerology: any belief in the divine or mystical relationship between a number and one or more coinciding events

Black box syndrome

- Study methodology is not mentioned in the study or is briefly referred to
- Key assumptions are buried in the appendix
- Study cannot be replicated

Theories created from correlations

- Underlying study model is correlational in nature
- R^2 becomes validation of causality
- Results start to be distributed with institutional authorship as proof of rigor and quality

ANOTHER RISK IN DATA ANALYSIS IS THE USE OF INDICES TO FORMULATE POLICIES

- Examples: WEF Competitiveness Index, ITU ICT Development Index, World Bank Ease of Doing Business, World Bank Logistics Performance Index
- Uses/misuses of indices
- Good use: policy agenda that builds on index strengths and addresses weaknesses
- Bad use: consider the index as a ranking of countries, accelerates policy imitation
- Risk of subjective judgment indicators in some indices
- Bias of subject matter experts
- Limited information in formulating judgment
- Problems in calculation:
- Methodology modification year on year introduces changes in ranking
- Multicollinearity of indicators could yield a bias
- Min-max methodologies put limitations in a country's rate of change year on year
- National indices hide in-country differences

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IN SUMMARY, DATA ANALYSIS IS A CRITICAL COMPONENT OF THE EVIDENCE REQUIRED TO DEVELOP ICT POLICY

- Policy makers should **avoid bypassing the need of generating empirical evidence** in support of country-specific ICT policies
- Policy makers should equip themselves with a **good understanding of advantages and disadvantages of each approach** in order to be ready to commission the approaches most relevant for the policy under consideration
- Policy makers should **build the technical capability to conduct independent assessment of the quality** of study results
- Governments should strive to **generate as much evidence as possible** to support policy development needs and monitor results

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