MICAT

Multiple Impacts Calculation Tool

Multiple Impacts of Energy Efficiency: Economic Indicators

MICAT Webinar series

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MICAT project on Multiple Benefits of Energy Efficiency

Source: IEA

Macroeconomic Impacts

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Energy efficiency measures

- Generate **demand for energy efficiency goods** such as insulation material and new electrical equipment that creates **direct, indirect and induced economic impacts** on overall and sectoral economic production and **employment**
- Result in **changes in imports of energy carriers** with subsequent effects on the trade balance
- Affect **energy prices** and thus competitiveness and the cost of living
- Affect **fiscal revenues and expenditures** through taxation on energy carriers and energy-related subsidies

The MICAT approach on macroeconomic impacts

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Key questions:

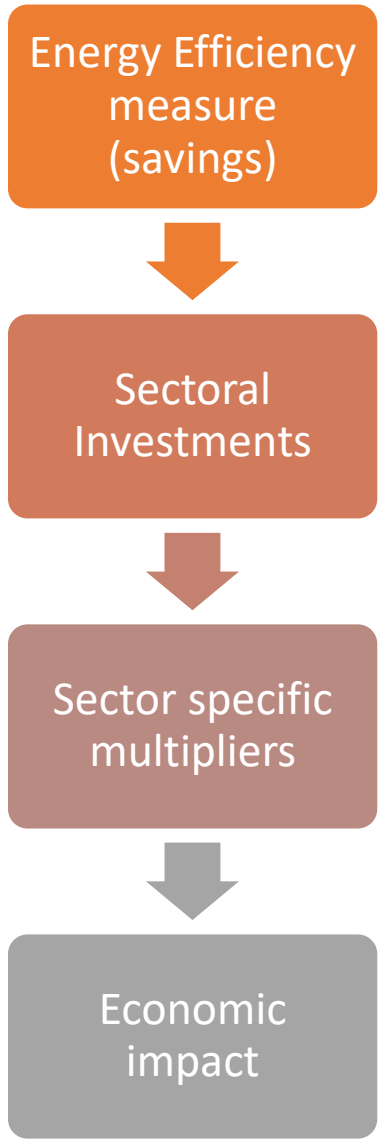
- Do energy efficiency measures impact **GDP**?
- What **sectoral shifts** can be expected?
- Will there be **employment** benefits?
- Are there **competitiveness** gains for the economy?

Methodology:

- Methodology with Leontieff multipliers: minimal end-user inputs required

Outputs:

- Estimates of economic impacts
- First step towards understanding economic co-benefits



MICAT indicators for (macro)economic impacts

Economic impact indicators	Quantification methodology / unit	Monetization
EcI-1 Impact on GDP	Input-Output analysis **Unit:** €	Expressed in million €
EcI-2 Employment effects	Input-Output analysis **Unit:** thousand persons	No monetization (unless associated with a mean wage by country)
EcI-3 Energy price effect	**Unit:** % change (range)	Directly monetized as it is expressed as a change in prices (€/energy unit)
EcI-4 ETS price effect	**Unit:** % change (€/tCO2)	Monetization via change in emission amounts possible (indicator expressed as €/tCO2)
EcI-5 Impact on sectoral shifts	Input-Output analysis **Unit:** € and thousand persons	GVA sectoral shifts: already expressed in € Employment-related shifts: monetized if associated with a mean wage by country and sector
EcI-5 Impact on competitiveness	Input-Output analysis **Unit:** % change of unit cost of production	The indicator can be monetized once the change in demand of goods is estimated (in mil. EUR)
EcI-6 Energy intensity	PRIMES model, final demand reduced by EEI actions divided by GDP **Unit:** ktoe/1000€	No monetization

Impact on GDP

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Motivation

- Understand the GDP implications of energy efficiency measures
- Ex-ante assessment

Methodology

- Static multiplier approach
- Value Added due to additional demand for sectors that deliver energy efficiency investments

Data requirements

- SIOT tables by country
- Sectoral allocation of investment expenditure

Output

- Additional generated GDP in million EUR

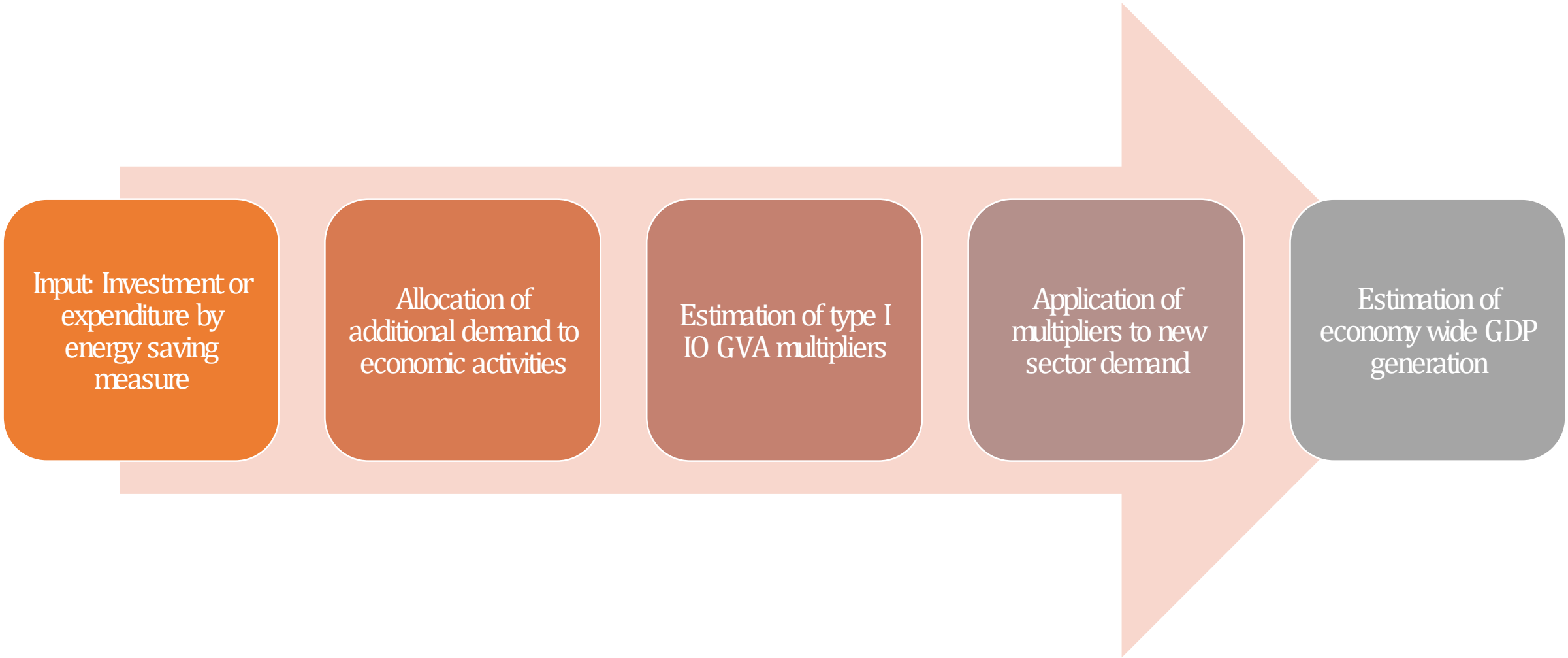
Limitations (I)

- Demand is considered additional and does not substitute existing demand or investments
- Allocation of investment is based on expert judgement, uniformly applied across all countries

Limitations II

- No structural changes considered
- No consideration of changes in fossil fuel imports or changes in overall trade of energy carriers,
- No consideration of changes in prices and factor markets
- No consideration of changes in the fiscal budget

Impact on GDP | Methodology



Impact on GDP | *Examples of sectoral allocation of investment expenditure by energy saving measure*

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Economic activity	Nace-code	Building envelope	Heating fuel switch	Energy-efficient heating
Other non-metallic mineral products	C23	20%		
Basic metals	C24	20%		
Computer, electronic and optical products	C26			5%
Electrical equipment	C27		15%	5%
Machinery and equipment n.e.c.	C28		50%	50%
Repair and installation services of machinery and equipment	C33		10%	15%
Constructions and construction works	F	40%	10%	10%
Retail trade services, except of motor vehicles and motorcycles	G47	10%	10%	10%
Architectural and engineering services; technical testing and analysis services	M71	10%	5%	5%

Impact on GDP | *Example of results*

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Annual energy saving expenditure in million €									
Subsector	Measure	Country	2020	2025	2030	2035	2040	2045	2050
Machinery	Space heating and cooling	Germany	150	150	150	150	150	150	150
Annual GVA generated by investment for energy saving measures									
Coefficient for GVA Effect in m. € per 1m. € of investments			2020	2025	2030	2035	2040	2045	2050
0.62			93.5	93.5	93.5	93.5	93.5	93.5	93.5

Impact on Employment

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Motivation

- Understand the employment implications of energy efficiency policies
- Ex-ante assessment

Methodology

- Static multiplier approach
- Employment in persons that will be generated in the economy by 1 m. € of new final demand

Data requirements

- SIOT tables by country
- Sectoral allocation of investment expenditure

Output

- Additional generated GDP in million EUR

Limitations

- Demand is considered additional and does not substitute existing demand or investments
- Allocation of investment is based on expert judgement, uniformly applied across all countries
- No structural changes considered

Impact on Employment | Methodology

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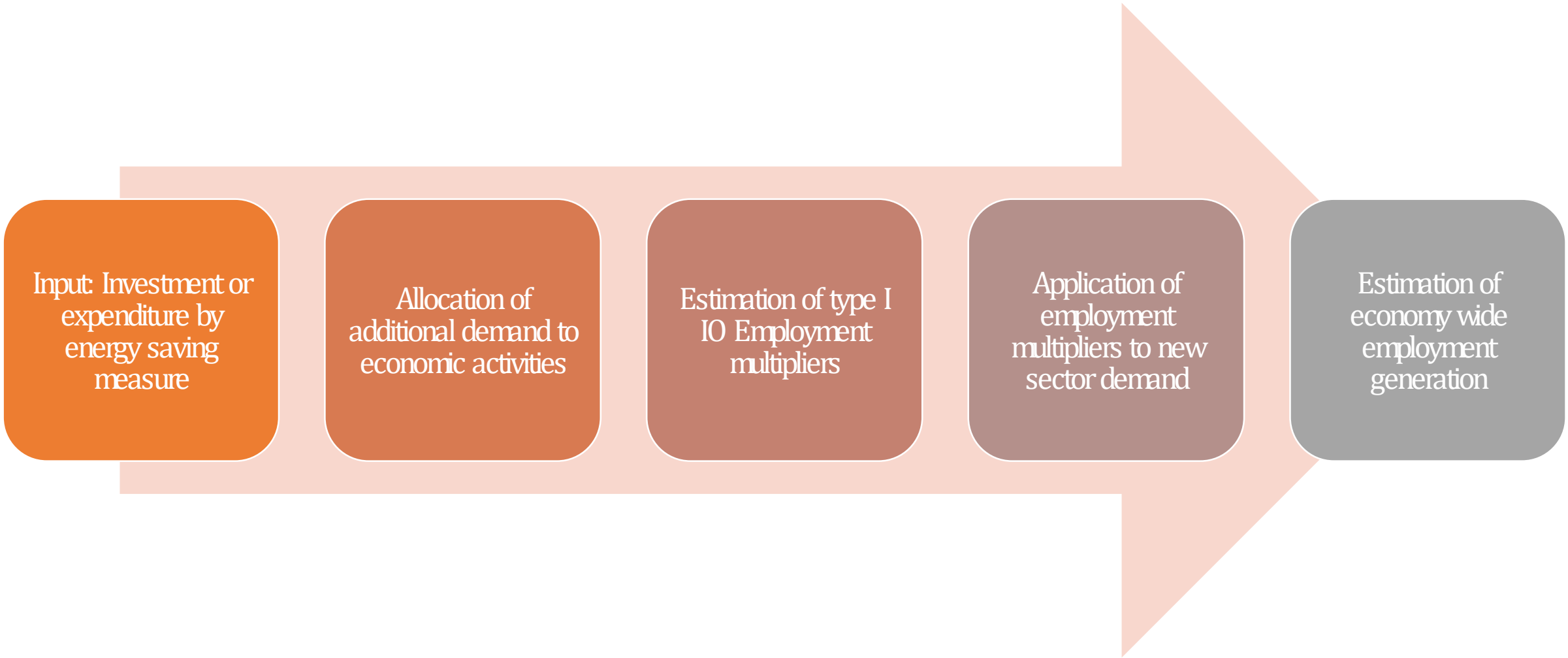

Impact on Employment | *Example of results*

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	Annual investments in million €								
Subsector	Measure	Country	2020	2025	2030	2035	2040	2045	2050
Average tertiary	Building envelope	Italy	150	150	150	150	150	150	150
	Annual additional employment generated by investment for energy saving measures								
Coefficient for employment Effect in jobs per 1m. € of investments			2020	2025	2030	2035	2040	2045	2050
13.88			2081.7	2081.7	2081.7	2081.7	2081.7	2081.7	2081.7

Impact on Competitiveness

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Motivation

- Impact of policies on unit production cost and related demand
- Important for energy intensive sectors
- Ex-ante assessment

Methodology

- Static multiplier approach
- Energy costs/purchases for an industry
- Basis is are the input/output

Data requirements

- Ratio of energy costs in total unit cost of production per sector based on an IO-Analysis
- Build up of industrial sector in country

Output

- Change in unit cost production
- (optional) Change in demand based on elasticities
- (optional) Change in demand for the product

Limitations

- No consideration of new expenditures for equipment goods or other types of energy saving investments
- No consideration of prices of other intermediate or factor inputs to production

Impact on Competitiveness | Methodology

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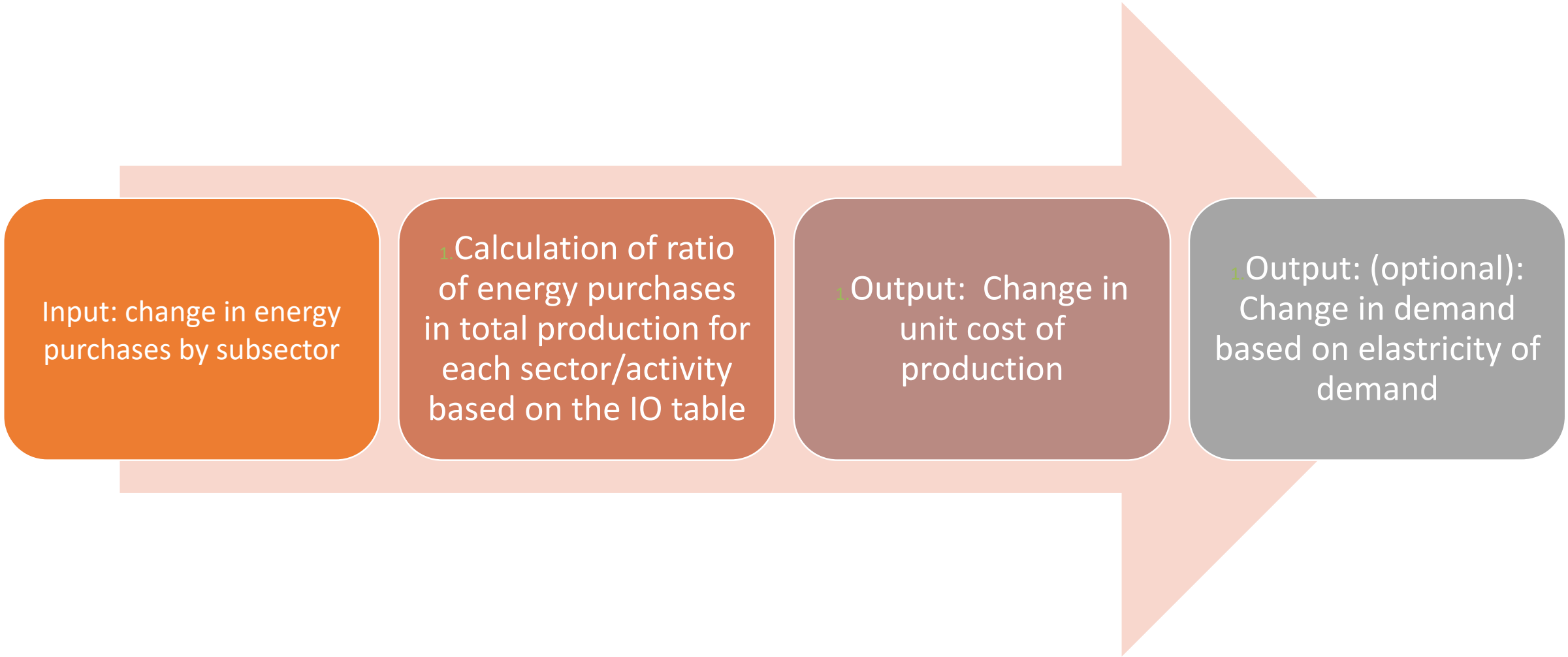

Impact on Competitiveness | *Example of results*

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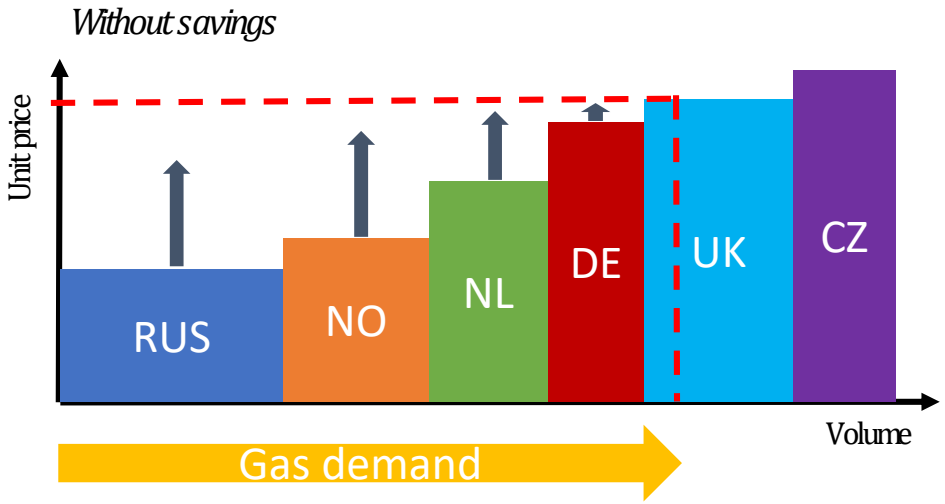
			Change in Energy Cost						
Subsector	Measure	Country	2020	2025	2030	2035	2040	2045	2050
Construction		Italy	-20%	-20%	-20%	-20%	-20%	-20%	-20%
Change in Unit Cost of Production									
			2020	2025	2030	2035	2040	2045	2050
			-0.4%	-0.4%	-0.4%	-0.4%	-0.4%	-0.4%	-0.4%

Energy security and energy delivery indicators

Energy security

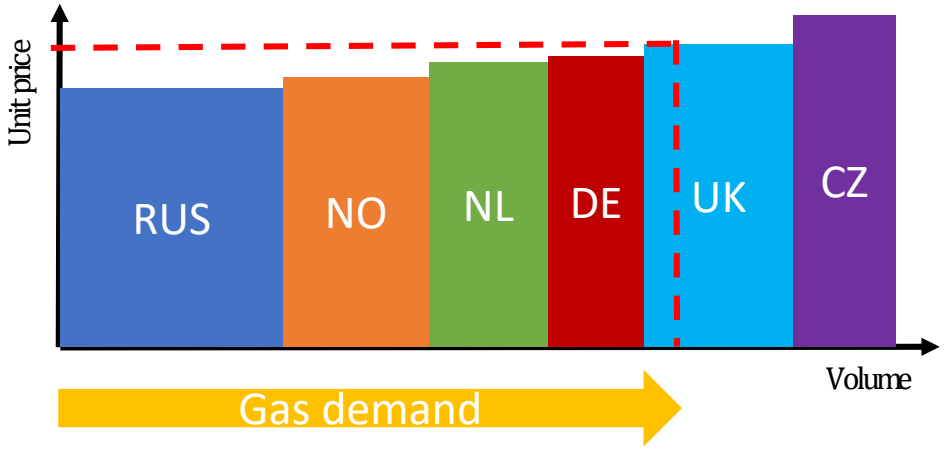
- Recently took over the spotlight
- Energy efficiency can reduce:
  - Overall volume of imports
  - Fossil fuel costs
  - Dependence on a few main suppliers
- What benefit is achieved depends on political and market decisions

Energy security

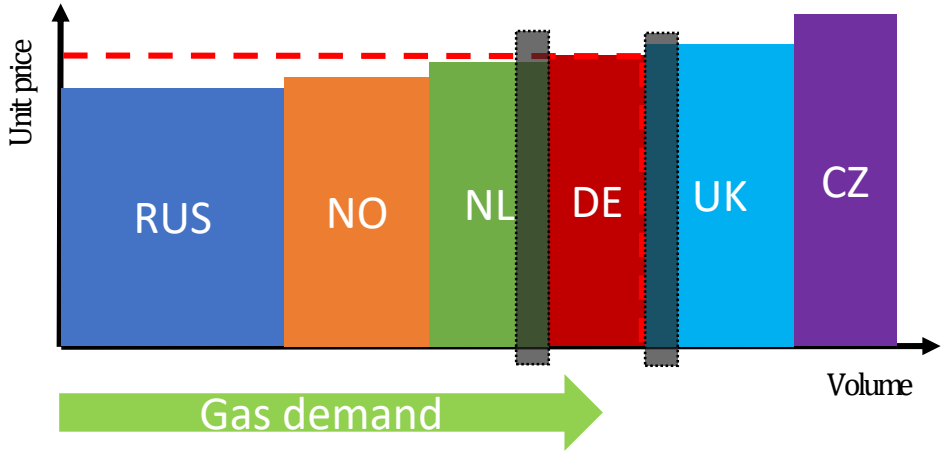


Energy security

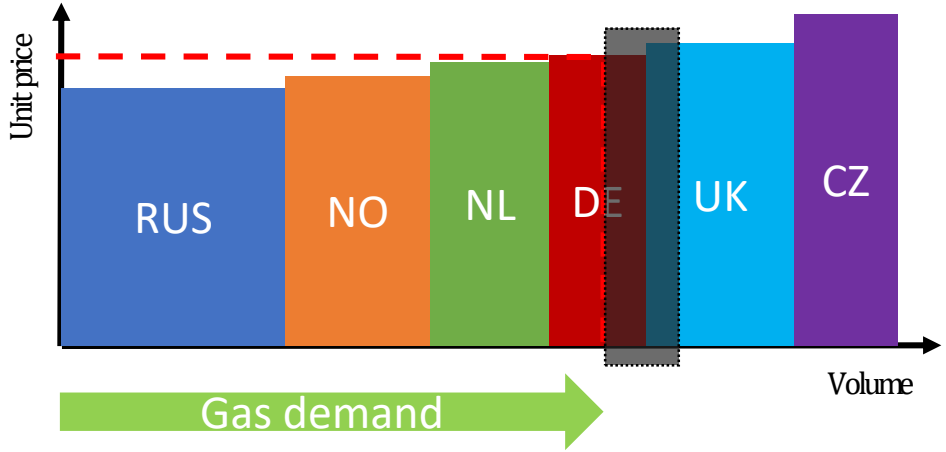
Without savings



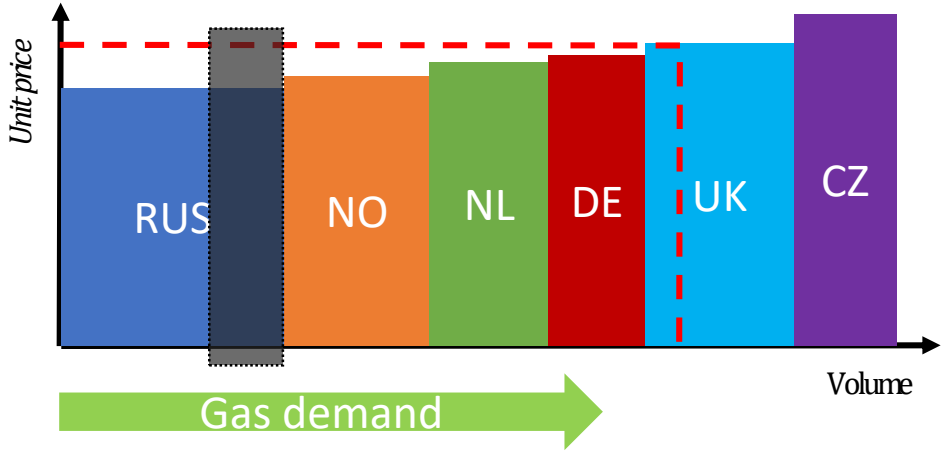
Reduction of overall volume of imports



Reduction of fossil fuel prices



Reduction of dependence on main suppliers



Energy security

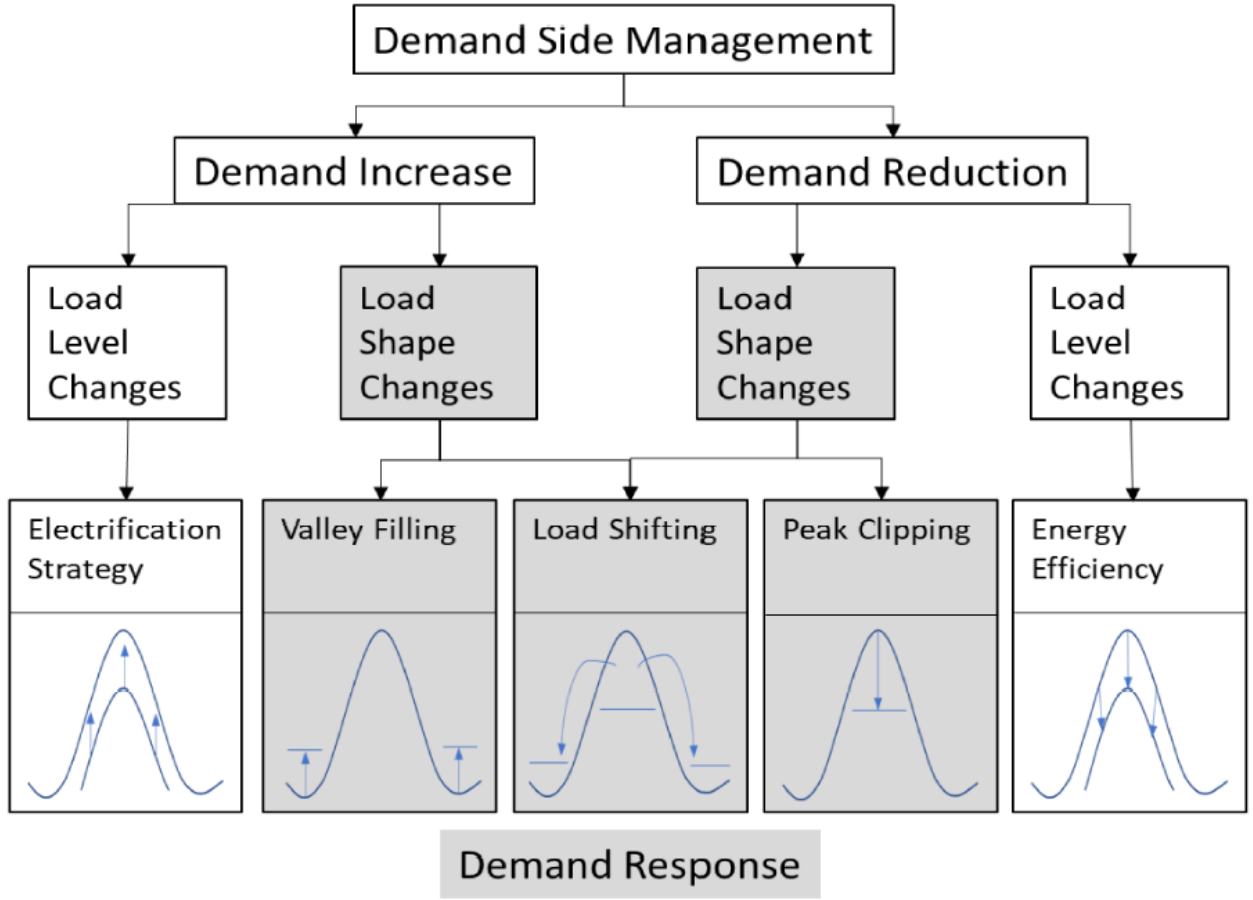
- MICAT shows the potential to achieve one of these benefits:
  - Reduction of import dependence
  - Increase in supplier diversity
- A monetisation of energy security is planned in the follow-up project

Integration of renewables

- Of increasing relevance thanks to the significant push for renewable energy sources
- Energy efficiency can increase but also reduce demand-response potentials
  - Electrification increases the potentials
  - Efficiency improvements reduce the capacity of the single demand-response facilities

Integration of renewables

- Energy efficiency can increase demand-response potentials:
  - Heat pumps allow heating to be flexibilised
  - Better insulated buildings can be heated in times of low electricity demand
  - Electric vehicles' batteries can be used as decentralised energy storages
- Energy efficiency might also reduce some previous demand-response potentials:
  - Domestic appliances
  - Industry flexibility



Krauss (2022), Gellings and Chamberlin (1987)

Integration of renewables

- To account for this, MICAT uses a two-fold approach
  - For each subsector and improvement action combination, a default demand-response potential coefficient is calculated
  - The total demand-response potential is scaled with electricity consumption, to account for potential reductions through energy savings
- The monetisation uses a combination of alternative technology costs and willingness-to-accept price

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THANK YOU

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