

# Empirical Basis of Economic Impacts Impact on Competitiveness



## Executive summary



Within MICAT, this indicator describes the impacts of energy saving measures on competitiveness. Competitiveness implications of planned policies or measures are of primary concern especially for sectors most exposed to energy-related expenditures. To assess these impacts, we calculate the ratio of energy costs in total unit cost of production per sector based on an IO-Analysis.

The analysis is limited to the estimation – in a static manner – of the competitiveness impacts that are associated with energy purchases, and does not consider any changes in expenditures for equipment goods or other types of energy saving investments. Moreover, the analysis does not take into account any subsequent changes in the prices of other intermediate or factor inputs to production.



## Scope of MI indicator



### Definition

Energy efficiency measures directly affect the energy costs associated with the production of goods and services, with subsequent implications to the overall cost structure and competitiveness of the sector. Competitiveness implications are a key indicator of the performance of specific policies and measures, of primary importance to sectors most exposed to energy expenditures. Here we assume that the change in energy costs/purchases will be provided as an input for the estimation of the competitiveness implications. Based on this input and the Input-Output tables, we estimate the change in the unit cost of production of each sub-sector defined by the project. Here we limit the analysis to estimating in a static approach the competitiveness impacts that are associated with energy purchases, but do not consider any changes in expenditures for equipment goods or other types of energy saving investments. We also do not take into consideration any subsequent changes in the prices of other intermediate or factor inputs to production.

### Relevance on EU, national and/or local level

This indicator is primarily relevant at national level, assuming the country-specific production structure of an industrial good. No data is available at a local level.



### Impact pathway figure

The methodology adopted to perform the assessment of the competitiveness indicator of the different energy saving measures is composed by the following steps:

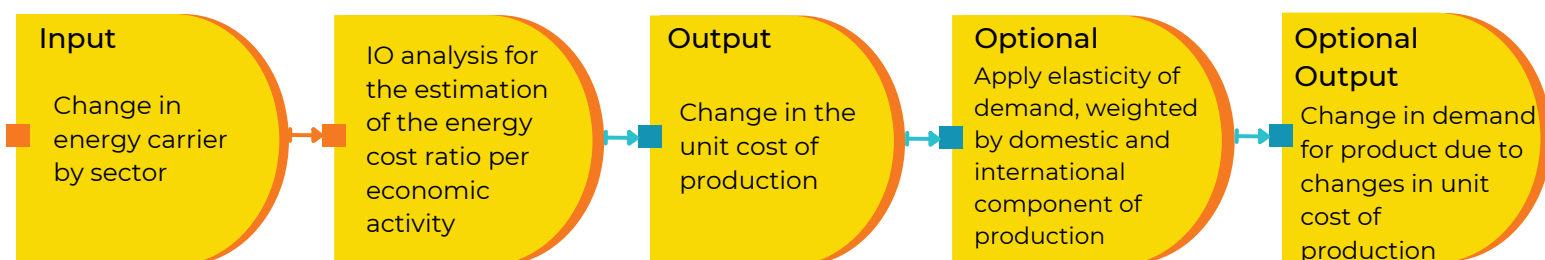


Figure 1: Quantification steps for the estimation of the competitiveness MI indicator

## Overlaps with other MI indicators and potential risk of double-counting

There is no risk of overlaps or double-counting with other MI indicators.

## Quantification method



### Description

A key step in order to estimate the competitiveness impacts is the calculation of the ratio of energy costs in total unit cost of production per sector. This is based on IO-Analysis. The competitiveness indicator provides a quantification of the change of the unit cost of production due to changes in energy costs (or purchases of energy carriers). As described in Figure 1, we follow the steps shown below for the quantification of this indicator.

- 1 Receive as input the change in energy purchases by subsector
- 2 Calculation of the ratio of energy purchases in total production for each sector/activity based on the IO table
- 3 Estimation of the change in unit cost of production
- 4 (optional) Estimation of the change in demand

To then derive the change in the unit cost of production, we prepare a concordance table between the 65 NACE sectors of our IO analysis and the subsectors defined by the project. We assume that the changes in energy purchases of the subsector (input by user) apply uniformly to all sectors that comprise this subsector.

The final step is to estimate the change in the **Unit Cost of Production** for each subsector. This rate is proportional to the energy cost change assumption as it is shown in the following formula:

First, we calculate the ratio of the energy purchases per economic activity, as a ratio of the total energy purchases to the sector's output production level based on IO table and according to the following formula:

$$NRG\_C_j = \frac{E_j}{PROD_j} \quad (1)$$

where:

$j$  : economic activities in IO table

$NRG\_C_j$  : the energy cost ratio per activity  $j$

$E_j$  : the energy carrier purchases consumed per activity  $j$  derived by the IO table

$PROD_j$  : the total output level of production per activity  $j$  derived by the IO table

$$UC_j = \Delta E_j \cdot NRG\_C_j \quad (2)$$

where:

$j$  : sectors of the economy

$NRG\_C_j$  : the energy cost ratio per activity  $j$

$\Delta E_j$  : the energy carrier purchases consumed per activity  $j$  derived by the IO table





## Data requirements

The starting point of the analysis is the latest available Symmetric Input Output tables (SIOT) by EU Member State, which are available in Eurostat for the year 2015. The sectoral resolution adopted in our analysis is the 65 sectors in NACE rev2. 2-digit, in line with the CPA resolution. Additionally, in order to evaluate the exact effect on the competitiveness, the energy cost changes, and the elasticities of demand should be assumed.

## Impact factor / functional relationship

The impact functional relationship is provided by equation (2). However an optional further step includes the estimation of the associated Change in Demand for each sector. This is based on elasticities of demand that are found in the literature and describe the relationship of changes in a price of good (in this case the unit cost of production) and the derived change in demand. The elasticity can be differentiated for the domestic and international component of production and in its general form can be described by:

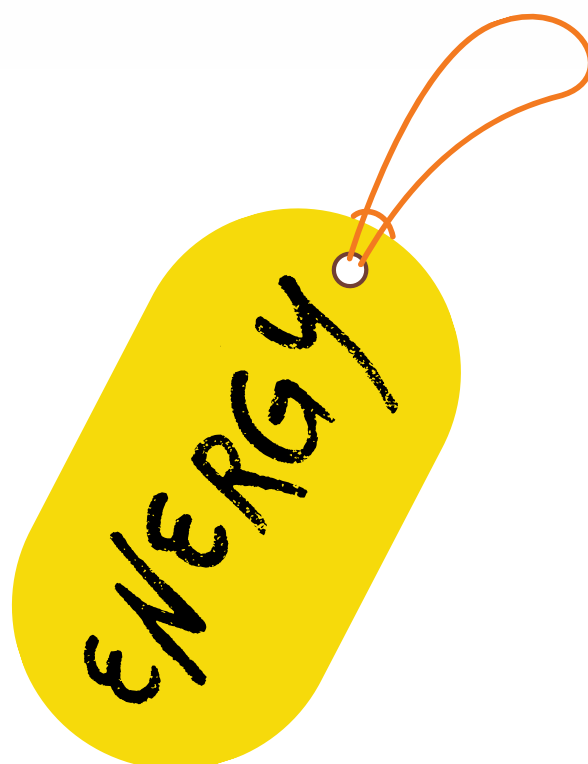
$$\frac{\Delta Q}{Q} = -\varepsilon \cdot UC_j \quad (3)$$

where:

$\frac{\Delta Q}{Q}$  : the change in demand

$\varepsilon$  : price elasticity of demand (from literature)

$j$  : sectors of the economy



## Monetisation

This indicator can be monetized once the change in demand of goods is estimated (in mil. EUR).

## Aggregation

This indicator cannot be directly aggregated with other indicators.

## Conclusion



Below we provide examples for the calculation of the competitiveness indicator for three selected EU Member States, namely Germany, Italy and Poland.

Table 1: Calculation of the competitiveness indicator for Germany


Change in Energy Cost									
Subsector	Measure	Country	2020	2025	2030	2035	2040	2045	2050
Average agriculture	Space heating and cooling	Germany	-10%	-10%	-10%	-10%	-10%	-10%	-10%
			Change in Unit Cost of Production						
			2020	2025	2030	2035	2040	2045	2050
			-1.2%	-1.2%	-1.2%	-1.2%	-1.2%	-1.2%	-1.2%

Table 2: Calculation of the competitiveness indicator for Italy



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%

Table 3: Calculation of the competitiveness indicator for Poland

Change in Energy Cost									
Subsector	Measure	Country	2020	2025	2030	2035	2040	2045	2050
Mining and quarrying		Poland	-30%	-30%	-30%	-30%	-30%	-30%	-30%
			Change in Unit Cost of Production						
			2020	2025	2030	2035	2040	2045	2050
			-5%	-5%	-5%	-5%	-5%	-5%	-5%