

THE COST OF ENERGY IN E-INFRASTRUCTURE

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**ΟΙΚΟΝΟΜΙΚΟ
ΠΑΝΕΠΙΣΤΗΜΙΟ
ΑΘΗΝΩΝ**



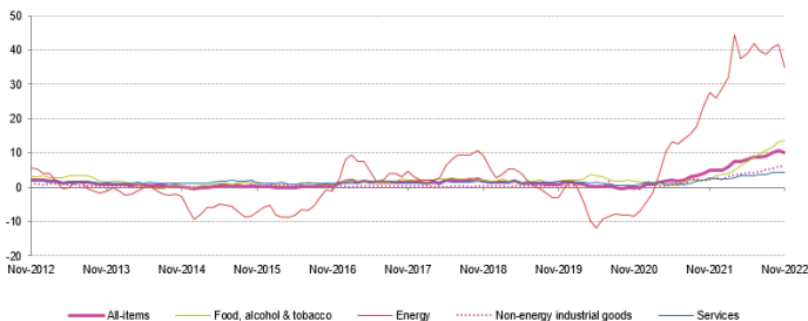
ATHENS UNIVERSITY
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ENERGY COST AND INFLATION

Research infrastructures
recently impacted by

- Increase in energy cost
- Inflation (driven by energy prices)
- **Calls for energy conservation**

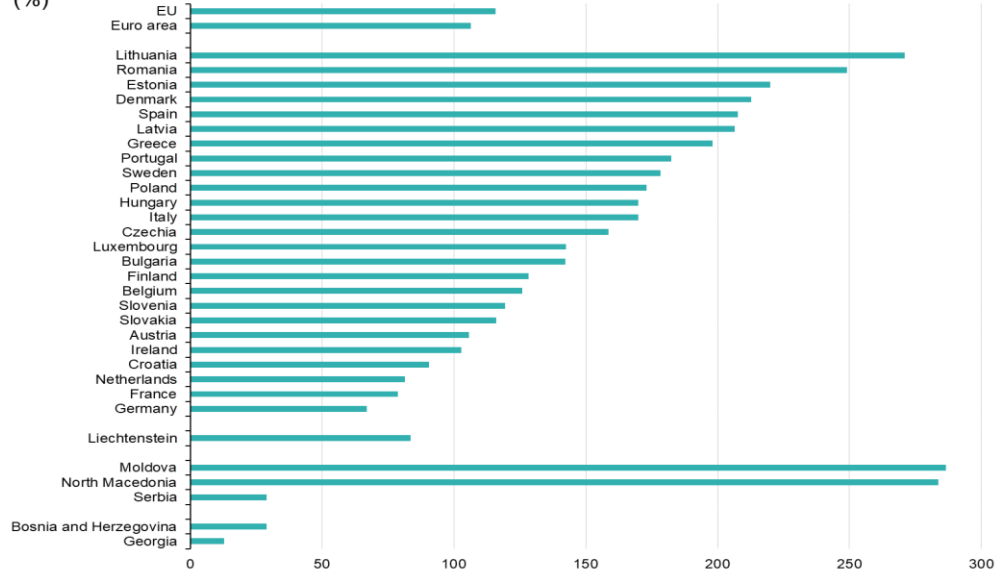
**Euro area annual inflation and its main components,
November 2012 - November 2022 (estimated)**
(%)



Source: Eurostat (online data code: prc_hicp_manr)

eurostat

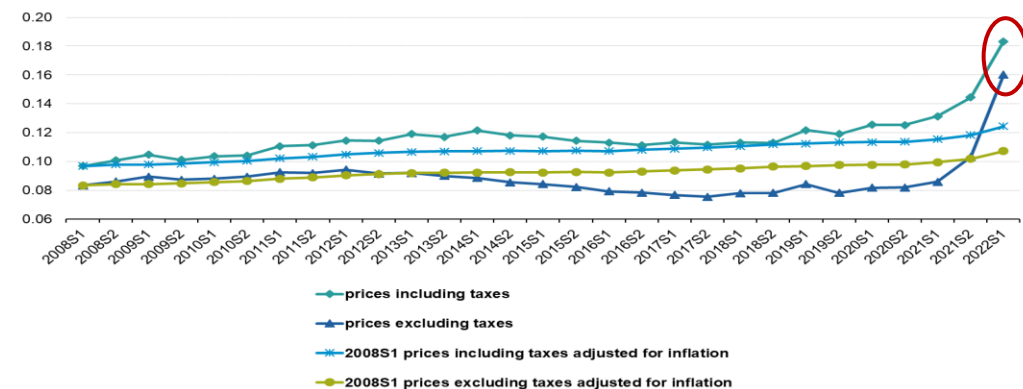
**Change in natural gas prices for non-household consumers compared
with previous year, same semester, first half 2022**
(%)



Source: Eurostat (online data codes: nrg_pc_203)

eurostat

**Development of electricity prices for non-household consumers, EU,
2008-2022**
(€ per kWh)



Source: Eurostat (online data codes: nrg_pc_205)

eurostat

EFFECTS ON OPEX AND CAPEX

Direct effect on OPEX – energy bill goes up

- More resources are needed for the same output
- It is a real outflow – Direct effect on the budget
- Sometimes not explicit
 - Lost in the opex of universities /research centers. Still the energy cost soars and affects budgets

Direct effect on OPEX – other operating expenses

- The cost of energy significantly affects inflation
- Inflation affects operating costs – prices for services and maintenance increase

Indirect effect on CAPEX through inflation

- Inflation directly impacts on investment costs (cost of acquiring infrastructure)
- An increase in the cost is expected to be seen in the future through the increased depreciation cost (more expensive investments – higher yearly depreciation)

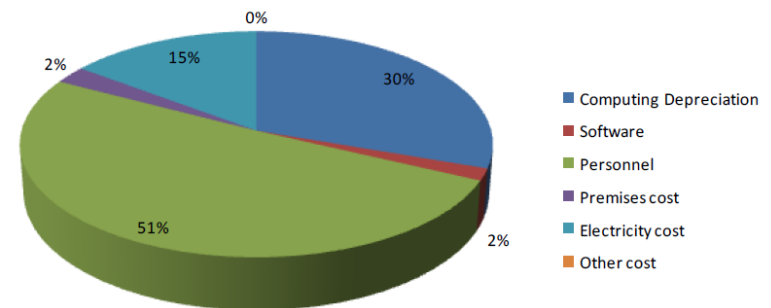
Inflation also affects the cost of capital

- The interest rates go up, making the cost of money more expensive

The e-FISCAL study in 2011 showed that electricity cost corresponds to 15% of total cost of service provision in e-infrastructure (50% FTEs and 30% depreciation)

Answers for 28 Research Centers from 16 countries (<http://efiscal.eu/>)

e-FISCAL median all - Cost break down



CONTROL OVER THE CHALLENGES

Out of the control
of the
organizations



Increases in
energy prices
/ inflation

Within (to an
extent) the control
of the
organizations



Calls for
energy
conservation

DEALING WITH THE ENERGY COST CHALLENGE


$$\text{Energy cost} = \text{Energy price} \times \text{Consumption}$$

Dealing with the energy cost

- ☐ Additional budgets
- ☐ Discounts in energy prices for specific use
 - ☐ Cap in energy prices for research
- ☐ Benefit from government policies for users' protection
- ☐ **Cutting down on other costs?**


$$\text{Energy cost} = \text{Energy price} \times \text{Consumption}$$

Dealing with the consumption

- ☐ Energy-efficient operations (e.g. reuse of energy)
- ☐ Energy conservation regarding the use of e-infrastructure (e.g. turning off devices)
- ☐ Energy conservation regarding the everyday operations (e.g. setting the thermostats lower during the winter, sun lighting)
- ☐ **Cutting down activity?**

CUTTING DOWN ACTIVITY TO CONSERVE ENERGY?

Cost
considerations

Cutting down activity and volume, due to increased energy costs, is expected to drive **unit costs up**

Usually, personnel cost and yearly depreciation of infrastructure are fixed costs and correspond to committed resources

Fixed costs allocated to less output are expected to increase unit cost

Committed resources underutilization

This is **not** evident in the budgets that focus on cash outflows

Research
consideration

Project
prioritization

Postponing
energy
intensive
research

Delaying the
start of new
projects

Cancelling
research
works

MANAGING THE ENERGY COST



Short term

- ☐ Energy savings
 - ☐ Conscious energy use
- ☐ Feedback on energy consumption – keep track of the energy use
 - ☐ Behavior change
- ☐ Scenario planning - estimation of the expected energy cost based on alternative levels of consumption and energy price levels
- ☐ Change in the business model to avoid energy use – use centralised cost-efficient cloud or other services?

Long term

- ☐ Established change in habits
 - ☐ Responsible consumption
- ☐ Innovations
 - ☐ In energy-efficient devices (hardware, storage, etc.)
 - ☐ In the reuse of energy from e-infrastructures for cooling and heating
- ☐ Making e-infrastructure greener
 - ☐ Volume of energy consumption
 - ☐ Type of energy consumed

THE CRISIS AS AN OPPORTUNITY

Making e-infrastructures more financially sustainable

- ☐ Improvement in the relation among the capacity utilization, the cost of resources used and the output
- ☐ More energy-efficient devices and operations for cost savings
- ☐ Setting up cost accounting systems for monitoring costs and output
 - ☐ Not only about energy!
 - ☐ Monitoring the utilization of available resources
 - ☐ Models with different levels of sophistication

Making e-infrastructures more environmentally sustainable

- ☐ Positive contribution to climate change
- ☐ Greener types of energy used
 - ☐ Energy-intensive research could consume self-produced energy through renewable sources – solar electricity panels
- ☐ Greener types of infrastructure
- ☐ Reusing of energy
- ☐ Need for green investments and supporting policies

DATA INFORMATION NEEDS

- ☐ Cost accounting information is useful for decision-making
 - ☐ Cost consciousness mentality
- ☐ Cost accounting systems are needed to gather and process cost information about operations
 - ☐ Suitable for the context / Some resources are not assigned to e-infrastructures as they are covered by host institutions (universities - small research centers)
 - ☐ New methodologies – simple and comprehensive enough – exchange of good practices
 - ☐ Cost refers to resource consumption
 - ☐ It provides indications of efficiency
 - ☐ Benchmarking with peers and the market
 - ☐ This is not the only information though! Success and value creation in research is not about cost
 - ☐ Budgets refer to cash outflows – they do not include the whole picture – they do not show the cost of existing infrastructure in use (depreciation)
 - ☐ Relating output with cost data
 - ☐ Getting a holistic view of resources consumed for a given output
 - ☐ Resources are constrained - Nothing is for free
 - ☐ Input for informed policy-making



THANK YOU FOR YOUR ATTENTION

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e-IRG Workshop (12.-13. Dec 2022) in Prague
organised in the framework of the
Czech Presidency of the Council of the Union

