

# Economic losses of reduced workability during heat waves: a case study of Europe

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## Background

- Recently, Europe has experienced several strong and long-lasting heatwaves, which caused many deaths.
- The probability of such heat events to occur in the upcoming decades is expected to increase.

## Knowledge gaps

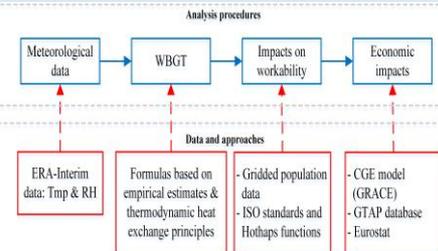
- Heat-induced impacts on workability are not well understood and quantified.
- Only a few studies address the impacts of heat stress on economic output and income.

## Objectives

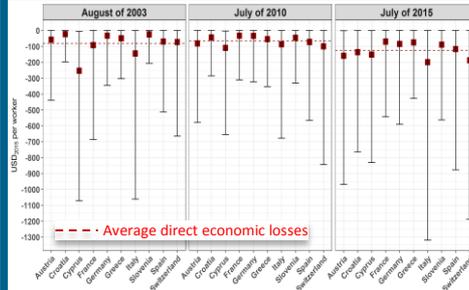
Assess the cost associated with the heat waves that occurred in Europe over the last two decades

## Method

Using historical meteorological data, we employ an interdisciplinary approach, which combines meteorological, epidemiological and economic analyses



## Direct economic losses from heat-induced reductions in workability in agriculture (per worker):

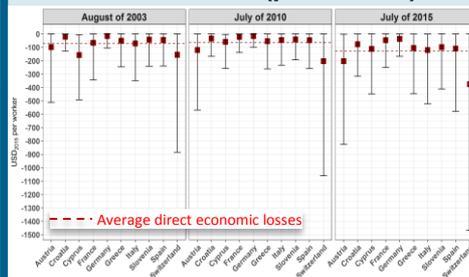


### Average direct economic losses:

- For August of 2003: \$85 per worker
- For July of 2010: \$69 per worker
- For July of 2015: \$127 per worker

The estimates are very uncertain, e.g., in Italy in July of 2015, losses might be \$1320 per worker.

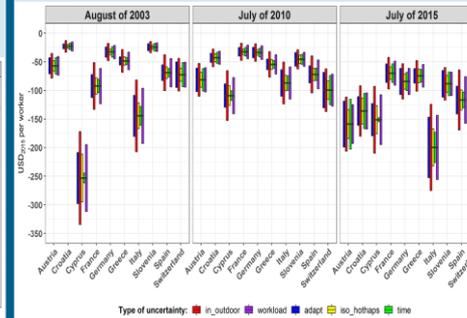
## Direct economic losses from heat-induced reductions in workability in construction (per worker):



### Average direct economic losses:

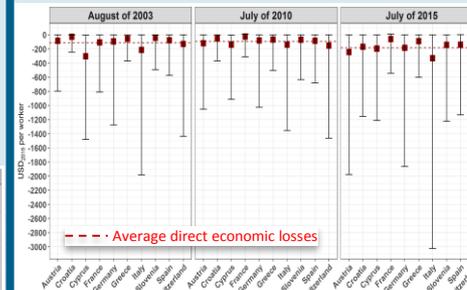
- For August of 2003: \$76 per worker
- For July of 2010: \$67 per worker
- For July of 2015: \$129 per worker

## Uncertainties:



The results are sensitive to the calculation of WBGT and the choice of heat stress metric.

## Social costs\* of heat-induced reductions in workability in agriculture (per worker):

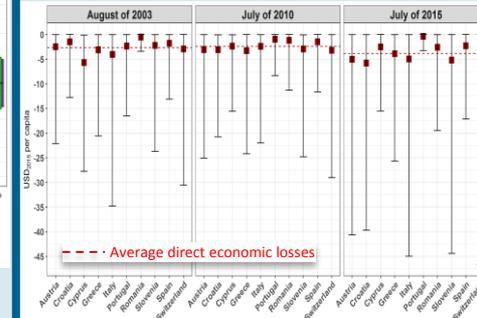


\* Social costs include direct economic losses and indirect losses, which occur due to cross-sectoral dependencies

### Average social costs compared to direct costs:

- 2003: 39% higher than direct costs
- 2010: 41% higher than direct costs
- 2015: 46% higher than direct costs

## Social costs of heat-induced reductions in workability in agriculture (per capita):



### Average social costs:

- For August of 2003: \$2.7 per capita
- For July of 2010: \$2.4 per capita
- For July of 2015: \$3.8 per capita

## Conclusions

- Economic losses from heat-induced reductions in workability could be **substantial for the private sector**.
- Total costs to the society seem rather moderate from our estimates.
- We don't consider other heat-related impacts contributing to total cost to society.

## Acknowledgements

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