



Mapping Research Productivity to Funding Sources Across Disciplinary and Interdisciplinary Research in Flanders



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KNOWLEDGE IN ACTION

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Outline

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Introduction: Research Productivity Measurement

- Research productivity can be defined as *“innovative thoughts and ideas which, after theoretical and applied studies, lead to the publication of articles in leading journals, patent registration, or documentation”* (Hedjazi & Behravan, 2011).
- Research productivity is assessed via the measurable outputs of research (e.g., publications, citations, patents) that reflect the efficiency and impact of knowledge creation (Abramo & D’Angelo, 2014)
- Measurement level: institutional level, journal level, researcher level

Introduction: Research Productivity Measurement

Various types of research productivity metrics:

- Traditional bibliometric indicators
 - Research volume (e.g. publication counts, patents)
 - Scholarly impact (e.g., Total & average citations, highly cited papers, relative & field citation rates)
 - Composite indexes: (e.g., h-index, g-index, p-index, i10 index)
- AltMetrics
 - Societal attention
- Other measurements: author collaborations (e.g., Collaborative coefficient);
Growth rate indicators (e.g., annual growth rate), country/regional level productivity (e.g., Activity Index, Publication Effectiveness Index)

Introduction: Research Productivity Measurement

- Challenges of traditional measures
 - Not fit for project-level evaluation of research productivity
 - Projects are temporary, diverse, & heterogeneous in scope, resources, & outputs

=> Importance of project-level productivity evaluation

- Integrates diverse types of output and input (project duration & effort)
- Informs funding allocation & policy design

Research funding & research productivity

- Influence of funding grants on research performance: institutional level & researcher level
- These findings have been inconclusive so far due to differences in scope, measured variables, and statistical models (Ebadi & Schifferauerova, 2016)
- Institutional level: positive correlations between funding grants & publication & citation counts
- Researcher level: most studies found:
 - a positive correlation between public grants and the number of peer-reviewed articles
 - larger amounts of funding associated with higher publication counts
 - no significant association between funding and publication quality (scholarly impact: average & relative citations etc.)

The research landscape in Flanders

Government actors

- ❑ Department WEWIS
- ❑ Research Foundation Flanders
- ❑ Flanders Entrepreneurship & Innovation (VLAIO)

Knowledge Institutions

- ❑ 5 University Associations (5 universities + 13 university colleges)
- ❑ 4 Strategic Research Centres (e.g., IMEC, VIB, VITO, Flanders Make)
- ❑ > 15 Specialized Scientific Institutes (e.g., VLIZ, ITG, INBO)

The research funding landscape in Flanders

- Public funding
 - Regional
 - Research Foundation Flanders (FWO)
 - The main public agency supporting fundamental and strategic research, funding researchers, projects, infrastructure, and international mobility
 - Special Research Funds (BOF), Industrial Research Funds (IOF)
 - Allocated annually by the Flemish government to universities, these funds are distributed through competitive systems to various Flemish institutions
 - Flanders Innovation and Entrepreneurship (VLAIO)
 - Federal: Belgian Science Policy Office (Belspo)
 - European: European Framework programmes - Horizon Europe etc.
 - International
- Private funding

The research funding landscape in Flanders

- Flemish Department WEWIS
 - monitors, evaluates & reports on science policies
 - coordinates and evaluates financing mechanisms
- Public funders aim to monitor & assess the impact of their funding on research activities & productivity
- Public funders aim to assess:
 - how funding programs support different types of research across disciplines
 - which funding programmes deliver the highest research productivity
 - whether the impact of public funding on research performance varies between disciplinary & interdisciplinary projects
 - how to distribute public funding for optimal impact on research productivity

Proposed Approach

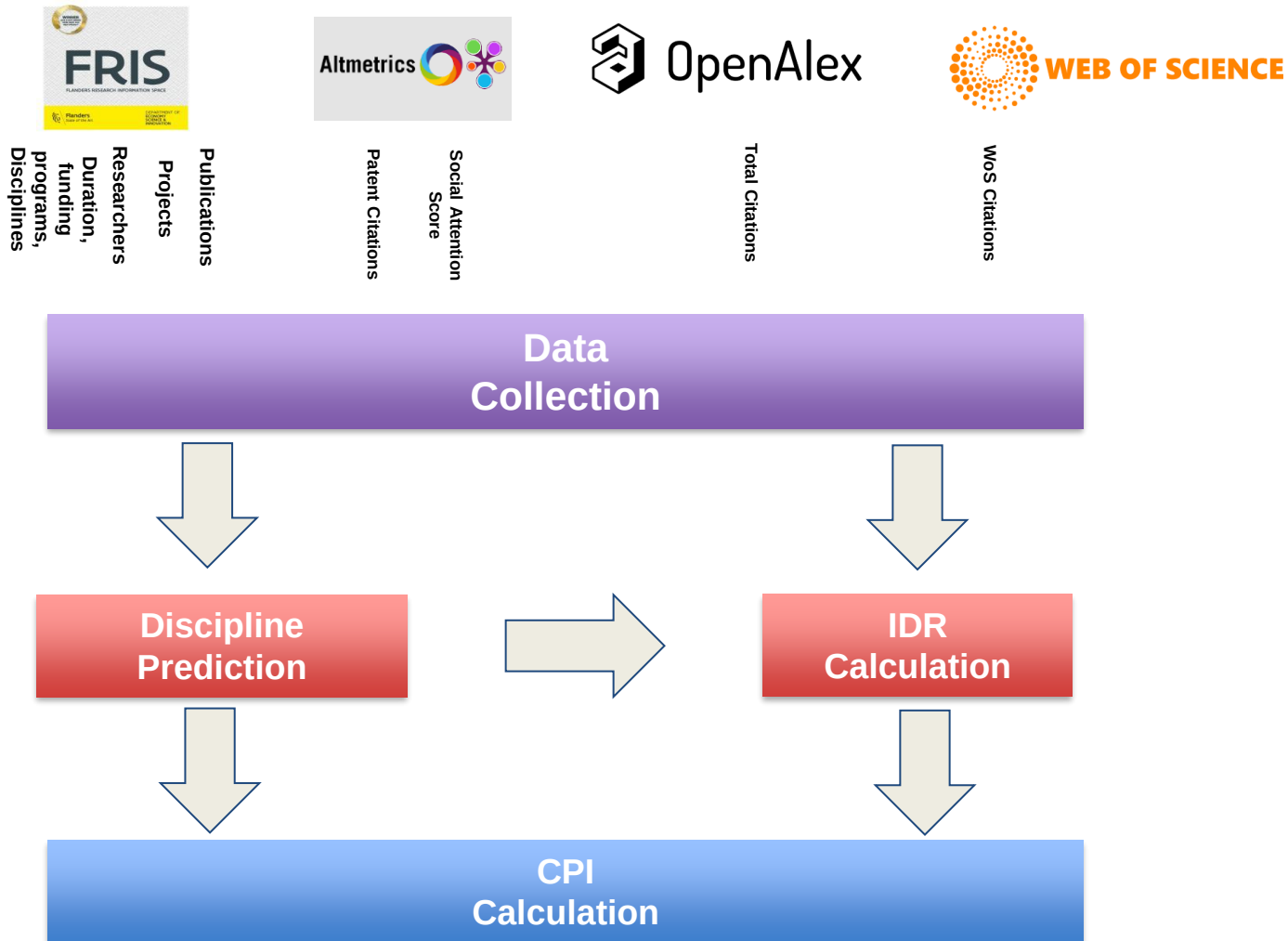
Objectives: We propose a method to analyse the relationship between research productivity and funding programmes for disciplinary and interdisciplinary research in Flanders.

Method: We developed a *Composite Productivity Indicator (CPI)* which integrates six factors to assess project productivity:

- number of publications having DOI	- count of citations to all publications
- number of publications indexed in Web of Science	- count of citations to WoS publications
- Altmetric Attention Score	- count patents mentioning the project publications

- We further adjust these factors to team size and project duration
- Together, these six indicators allow us to capture a balanced view of productivity, ranging from quantity and quality to scientific influence, societal engagement, and innovation potential

System Overview



Conducted Analysis: Objectives

- to calculate *CPI* of research projects in FRIS DB for a specific year / period of time.
- to measure the productivity of funding programmes in a certain year / period of time.
- to find the correlation between scientific disciplines and productivity
- to analyze how interdisciplinarity is correlated with productivity
- to find out which indicator from the used six ones has the highest influence on productivity.

Conducted Analysis: Workflow

Extract Publications

Extract all publications
from year of interest (e.g.
2023)

Link to FRIS Projects

Link publications to
projects in FRIS DB

Add Bibliometrics

Extract bibliometrics:
– Total citations
– WoS citations
– Societal score
– Innovation indicators

Compute CPI & Aggregate

Calculate CPI per project
Aggregate by funding
programme & disciplines

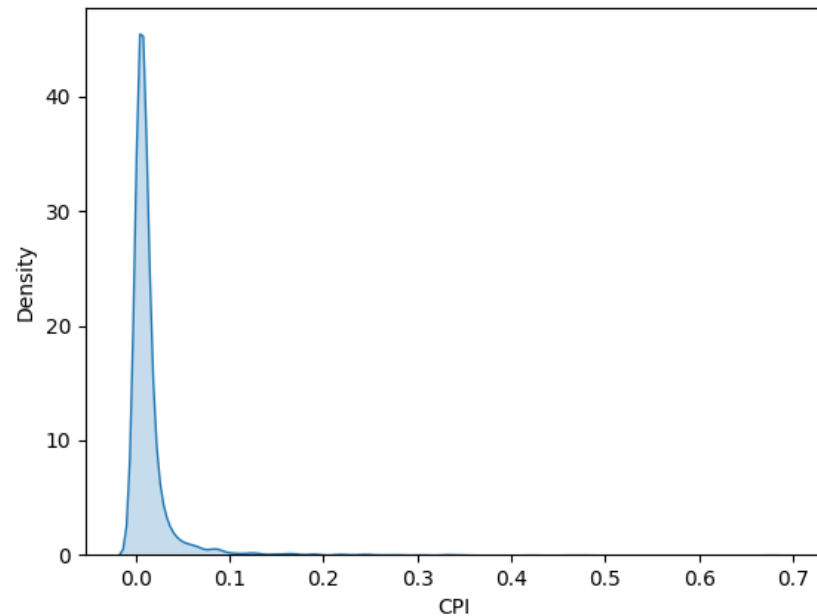
**Workflow: Calculating CPI per Project
& Aggregation by Programme & Discipline**

Results

- Data collection:
 - Publications published in 2023: 6324
 - Number of projects: 4697
- Statistics of CPI values

	CPI
count	4697
mean	0,014473
std	0,03273
min	0,000315
25%	0,003428
50%	0,005919
75%	0,012195
max	0,67626

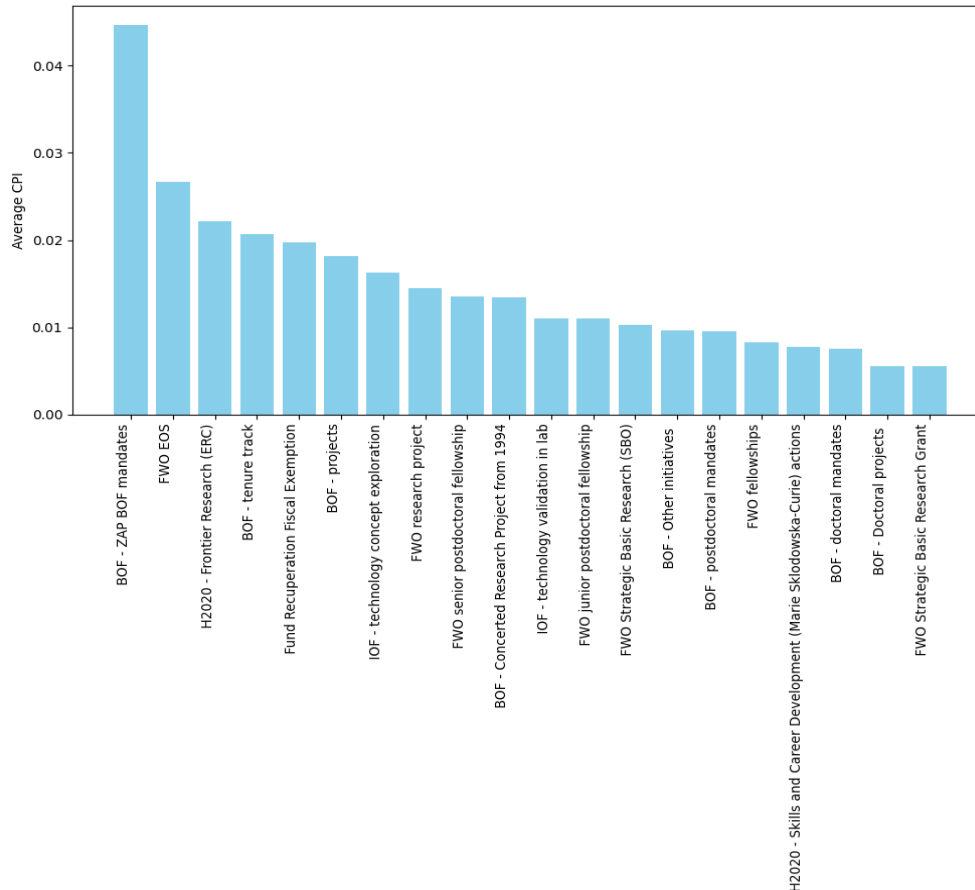
Distribution of CPI values



Research productivity is unevenly distributed across projects

Results

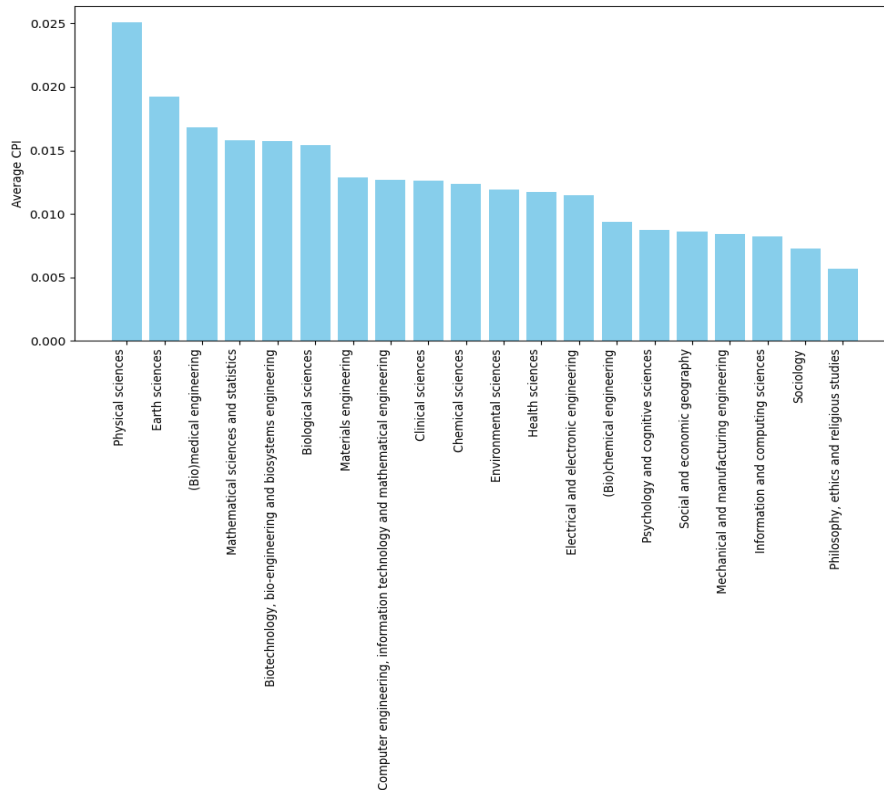
■ How does CPI vary by funding programme?



- Higher CPI: BOF-ZAP
BOF mandates, FWO
EOS, H2020 ERC
- Lower CPI: BOF
Doctoral Projects, FWO
SBO, some social
sciences
- Programme design +
disciplinary context
strongly shape
outcomes

Results

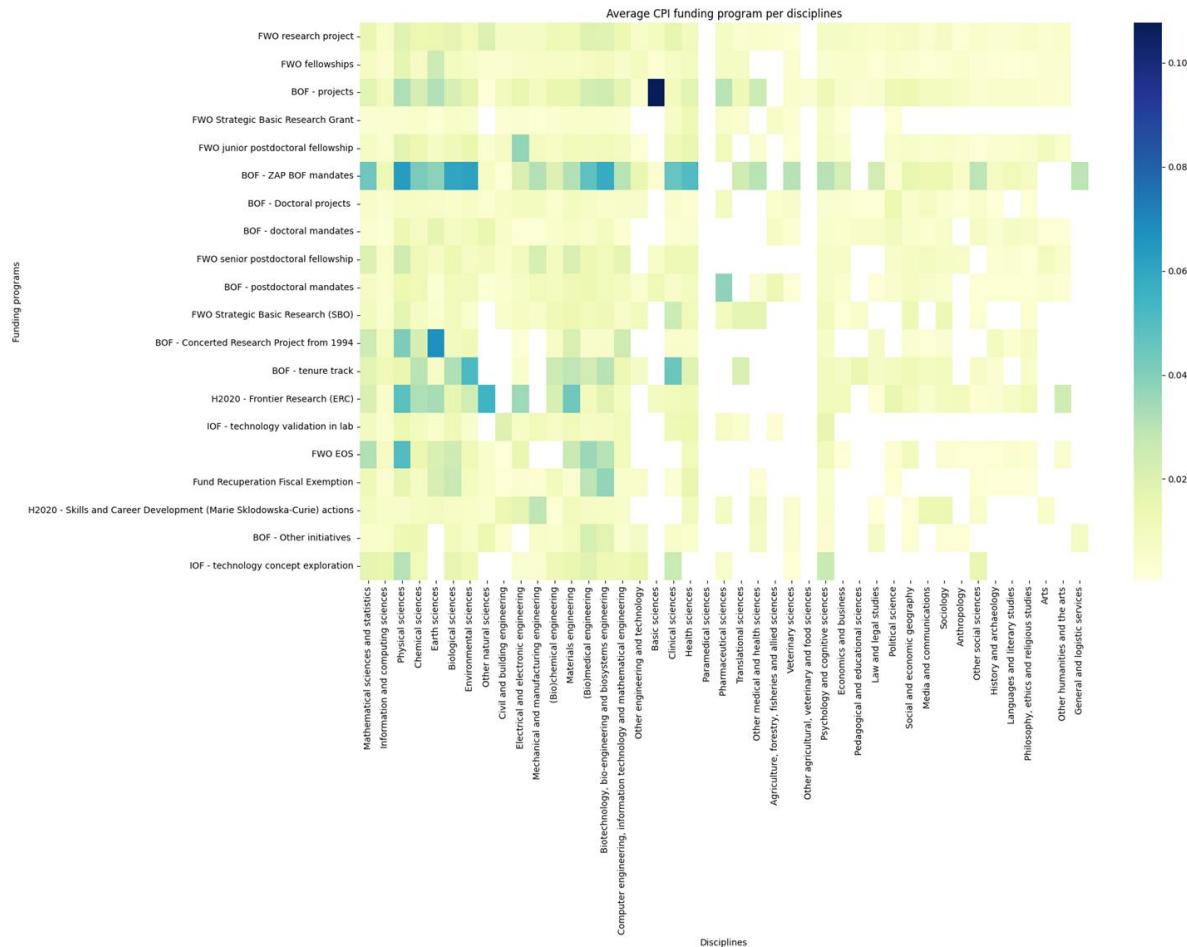
- Which scientific disciplines yield higher (or lower) CPI?



- Funding schemes effective in some fields but weaker in others
- Evaluations must consider **contextual fit**

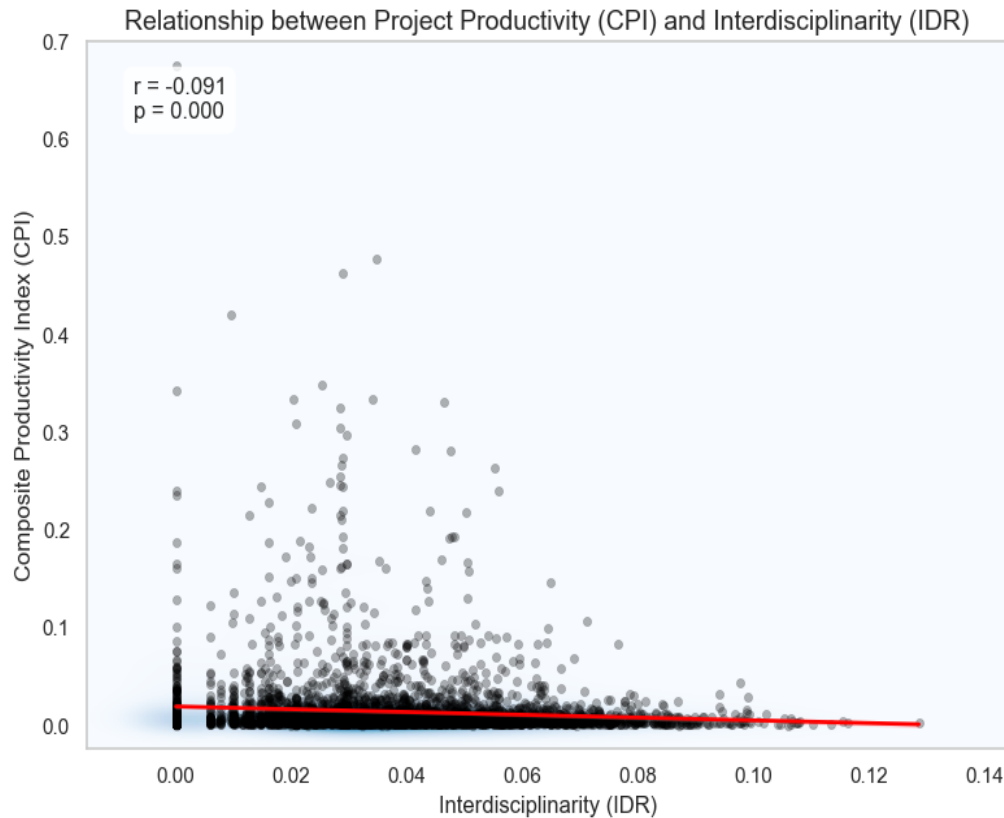
Results

- Interaction effects—e.g., does programme × discipline matter?



Results

■ Does interdisciplinary correlate with CPI?

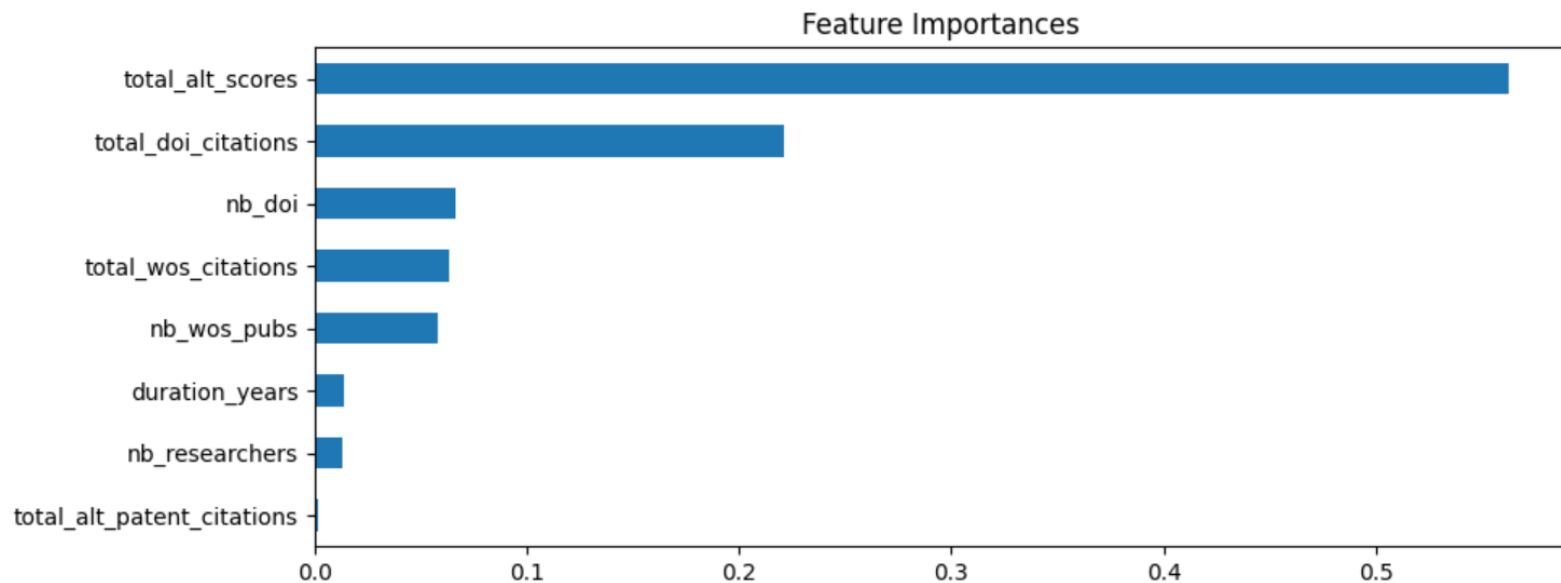


Interdisciplinary projects did **not systematically outperform** mono-disciplinary ones

Possible reasons: longer time horizons, publication/citation biases

Results

- Feature importance:
 - Societal attention and Citation indicators strongest predictors of high CPI
 - Number of publications & patent citations smaller role



Conclusions

- We proposed a composite productivity metric (*CPI*) to analyse the relationship between research productivity and funding programmes for disciplinary and interdisciplinary research in Flanders.
- *CPI* integrates scholarly, societal, and technological dimensions
- *CPI* provides a systematic assessment of project-level productivity

Conclusions

- In our data analysis:
 - productivity varies across programmes & disciplines
 - funding programme–discipline interactions matter for evaluation of productivity
 - interdisciplinarity was found not to correlate with productivity.
 - Citations were found the strongest predictors of productivity → societal & patent impacts less visible

Future Work

- Balancing scholarly, societal and technological factors contribution in the assessment of productivity (eg. refine *CPI* weights).
- Expanding considered research outputs to include datasets, research software and non-academic contributions.
- Use longitudinal analyses to capture delayed impacts (esp. interdisciplinary work).
- Apply *CPI* on other national & international datasets to test its robustness and generalizability.

Thank you for your attention

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