

Reporting Summary

Nature Portfolio wishes to improve the reproducibility of the work that we publish. This form provides structure for consistency and transparency in reporting. For further information on Nature Portfolio policies, see our [Editorial Policies](#) and the [Editorial Policy Checklist](#).

Statistics

For all statistical analyses, confirm that the following items are present in the figure legend, table legend, main text, or Methods section.

n/a Confirmed

- | | | |
|-------------------------------------|-------------------------------------|--|
| ☐ | ☒ | The exact sample size (n) for each experimental group/condition, given as a discrete number and unit of measurement |
| ☐ | ☒ | A statement on whether measurements were taken from distinct samples or whether the same sample was measured repeatedly |
| ☐ | ☒ | The statistical test(s) used AND whether they are one- or two-sided
<i>Only common tests should be described solely by name; describe more complex techniques in the Methods section.</i> |
| ☐ | ☒ | A description of all covariates tested |
| ☐ | ☒ | A description of any assumptions or corrections, such as tests of normality and adjustment for multiple comparisons |
| ☐ | ☒ | A full description of the statistical parameters including central tendency (e.g. means) or other basic estimates (e.g. regression coefficient) AND variation (e.g. standard deviation) or associated estimates of uncertainty (e.g. confidence intervals) |
| ☐ | ☒ | For null hypothesis testing, the test statistic (e.g. F , t , r) with confidence intervals, effect sizes, degrees of freedom and P value noted
<i>Give P values as exact values whenever suitable.</i> |
| ☒ | ☐ | For Bayesian analysis, information on the choice of priors and Markov chain Monte Carlo settings |
| ☒ | ☐ | For hierarchical and complex designs, identification of the appropriate level for tests and full reporting of outcomes |
| ☐ | ☒ | Estimates of effect sizes (e.g. Cohen's d , Pearson's r), indicating how they were calculated |

Our web collection on [statistics for biologists](#) contains articles on many of the points above.

Software and code

Policy information about [availability of computer code](#)

Data collection	We did not use any open source codes for data collection in this study.
Data analysis	We performed most analysis with Python 3.8.10, using such as pandas and other adequate modules. For regression analysis, we used reghdfe package in Stata16.1. For fitting each paper's citation dynamics to a generative model as robustness checks, we adopted the maximum likelihood estimation method using Python 3.8.

For manuscripts utilizing custom algorithms or software that are central to the research but not yet described in published literature, software must be made available to editors and reviewers. We strongly encourage code deposition in a community repository (e.g. GitHub). See the Nature Portfolio [guidelines for submitting code & software](#) for further information.

Data

Policy information about [availability of data](#)

All manuscripts must include a [data availability statement](#). This statement should provide the following information, where applicable:

- Accession codes, unique identifiers, or web links for publicly available datasets
- A description of any restrictions on data availability
- For clinical datasets or third party data, please ensure that the statement adheres to our [policy](#)

The Microsoft Academic Graph data can be downloaded via <https://www.microsoft.com/en-us/research/project/microsoft-academic-graph/> or https://zenodo.org/record/2628216#.Y-7RR_5Bz-g. The Global Universities Ranking data was downloaded from <https://www.usnews.com/education/best-global-universities/rankings>.

We followed terms and conditions when collecting the data.

Human research participants

Policy information about [studies involving human research participants and Sex and Gender in Research.](#)

Reporting on sex and gender

We did not consider gender in this study.

Population characteristics

We did not consider actual population characteristics in this study.

Recruitment

We did not recruit any participant.

Ethics oversight

Our study does not contain human research participants.

Note that full information on the approval of the study protocol must also be provided in the manuscript.

Field-specific reporting

Please select the one below that is the best fit for your research. If you are not sure, read the appropriate sections before making your selection.

☐ Life sciences

☒ Behavioural & social sciences

☐ Ecological, evolutionary & environmental sciences

For a reference copy of the document with all sections, see [nature.com/documents/nr-reporting-summary-flat.pdf](https://www.nature.com/documents/nr-reporting-summary-flat.pdf)

Behavioural & social sciences study design

All studies must disclose on these points even when the disclosure is negative.

Study description

We studied the effect of interdisciplinarity on the time to reach the actual major impact for individual scientific papers. The data was largely quantitative in nature, i.e., the Microsoft Academic Graph dataset. We then went one step further to test underlying forces behind such impact, including institutional reputations, organizational features, and content conventionality, which are detectable from data in our context, finding that they cannot fully explain the delayed impact of interdisciplinary research.

Research sample

We used the Microsoft Academic Graph, which contains 200 million digital publications, as described in the manuscript. We focused on more than 16 million journal articles published between 1970 to 2007.

Sampling strategy

No statistical methods were used to predetermine sample size. Our dataset represents the state-of-the-art large-scale corpus of its kind, and no random/snowball/stratified sampling is used.

As our study focused on the interdisciplinary nature of individual papers, we mainly focus on papers with at least two references in the regression analysis. Note that the results are robust with respect to this choice, as we also control for the number of references in the analysis. In order to visualize the relationship between paper interdisciplinarity and T_m defined in the manuscript, we also consider papers with at least five references. To quantify the time to reach the citation peak throughout the citation dynamical history, we ignored papers without citations or without citation peaks defined in the manuscript. We also repeat our analysis for different years, different scientific fields, as well as papers with different citation impacts, finding our main conclusions robust.

Data collection

The Microsoft Academic Graph data can be downloaded via <https://www.microsoft.com/en-us/research/project/microsoft-academic-graph/>. The Global Universities Ranking data was downloaded from <https://www.usnews.com/education/best-global-universities/rankings>.

Timing

The Microsoft Academic Graph data was collected in 2019. The Global Universities Ranking data was collected in August 2021.

Data exclusions

The analysis has no data exclusions. Selection criteria within a dataset are described in the manuscript.

Non-participation

There are no participants in this study.

Randomization

This is a data driven study, not a randomized experiment

Reporting for specific materials, systems and methods

We require information from authors about some types of materials, experimental systems and methods used in many studies. Here, indicate whether each material, system or method listed is relevant to your study. If you are not sure if a list item applies to your research, read the appropriate section before selecting a response.

Materials & experimental systems

n/a	Involved in the study
☒	☐ Antibodies
☒	☐ Eukaryotic cell lines
☒	☐ Palaeontology and archaeology
☒	☐ Animals and other organisms
☒	☐ Clinical data
☒	☐ Dual use research of concern

Methods

n/a	Involved in the study
☒	☐ ChIP-seq
☒	☐ Flow cytometry
☒	☐ MRI-based neuroimaging