Cost-Effectiveness of a Large Language Model for Indexing Biomedical Abstracts
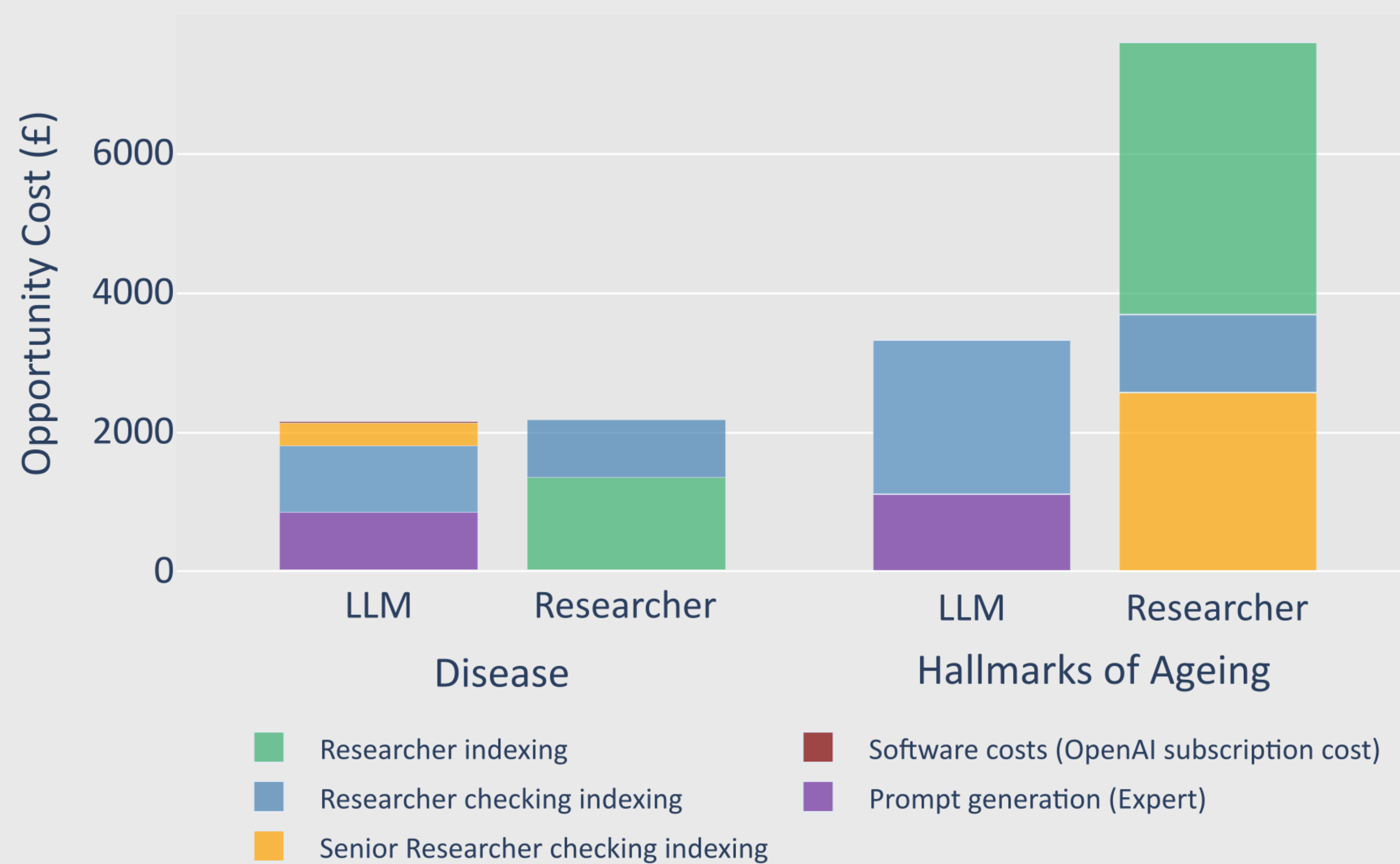
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Background

- Large language models (LLMs) are widely used for research tasks; however, they require human expert input to create suitable prompts for accurate outputs. This raises questions about their cost-effectiveness.
- We have previously reported the accuracy of LLMs in indexing abstracts by disease area and hallmarks of ageing.
- Now, we aim to evaluate the costs of both manual and LLM-assisted indexing approaches to determine the most cost-effective method.

Methodology

- Using an *online evidence mapper tool* (www.evidencemapper.co.uk), we classified 500 abstracts on anti-ageing treatments by disease area and hallmarks of ageing.
- We *calculated the cost* of manually indexing and verifying abstracts by considering the opportunity cost, using indicative hourly rates of £130 for researchers and £150 for senior researchers. For LLM use, costs included software fees, the opportunity cost of the expert generating the prompt (at an indicative cost of £280 per hour), and the time researchers spent verifying the LLM's indexing.
- Costs were *stratified by task complexity*: disease indexing vs. hallmarks of ageing indexing.

Legend:
- Researcher indexing
- Researcher checking indexing
- Senior Researcher checking indexing
- Software costs (OpenAI subscription cost)
- Prompt generation (Expert)

Disease Indexing

Hallmarks of Ageing Indexing

Time taken (hours)

Results

- Manually indexing abstracts by disease area, a conceptually straightforward task, cost £2,197 for 16.9 hours of work while using an LLM cost £2,171.35, including £840 for the expert, £1,312.50 for researchers, and £18.85 for software.

- For the more complex task of indexing by hallmarks of ageing, manual indexing cost £7,598 (55.8 hours). Using an LLM cost £3,348.85, comprising £1,120 for the expert, £2,210 for researchers' verification, and £18.85 for software.
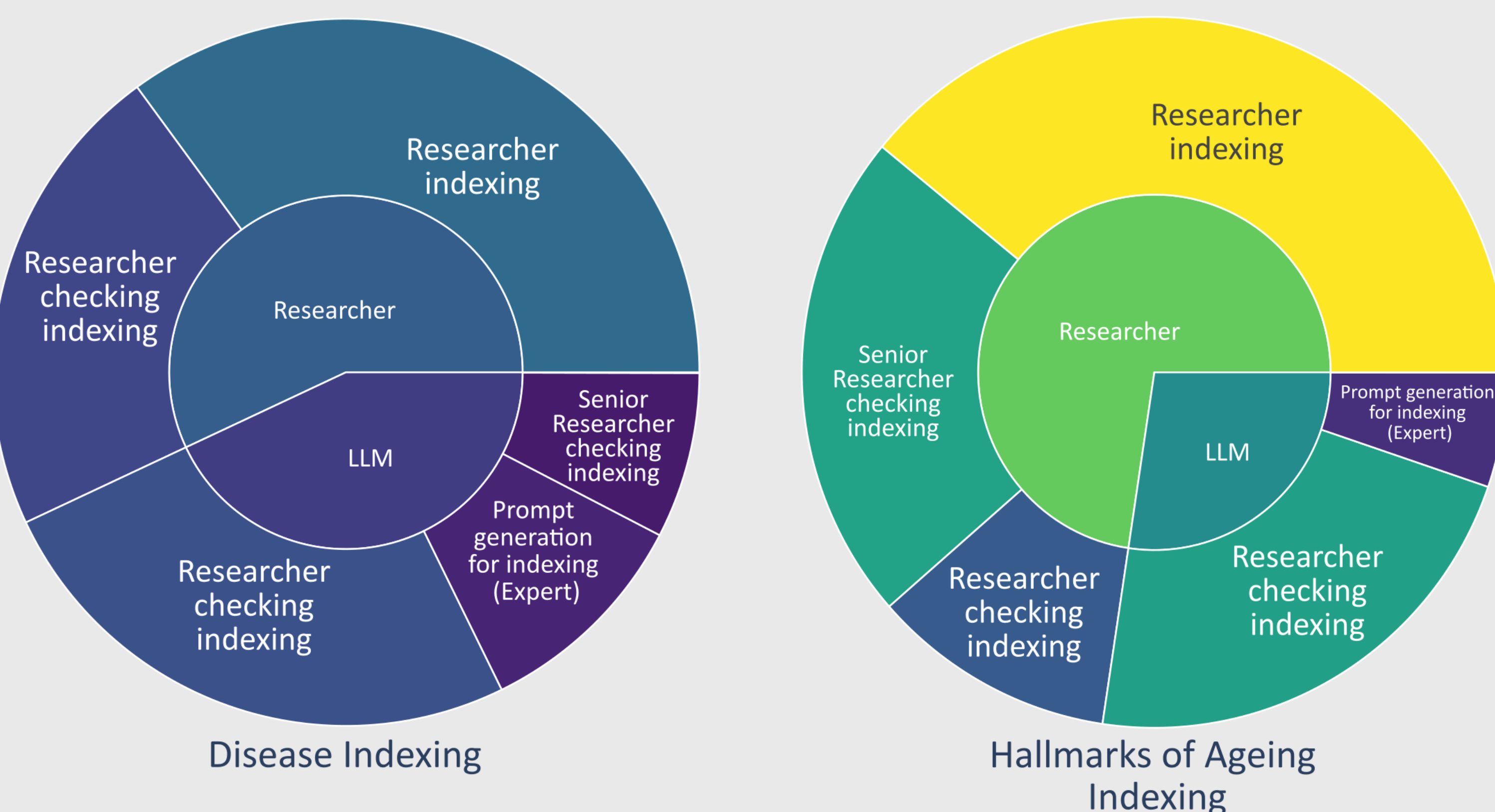
Conclusions

- Our study demonstrates that there can be an *economic advantage of using LLMs* for repeated indexing tasks.
- The *cost-savings are greater* where the *data to be indexed is more complex*, as human researchers need longer to process the data.
- The *time taken to set up* an accurate prompt suggests that LLMs may be *more cost-effective for larger data sets*, as the marginal cost of indexing additional abstracts is small.

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