Comments on “Quantifying the impact of AI invention on productivity” by Lee Branstetter and his collaborators

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1 Division of innovative labors between upstream and downstream firms

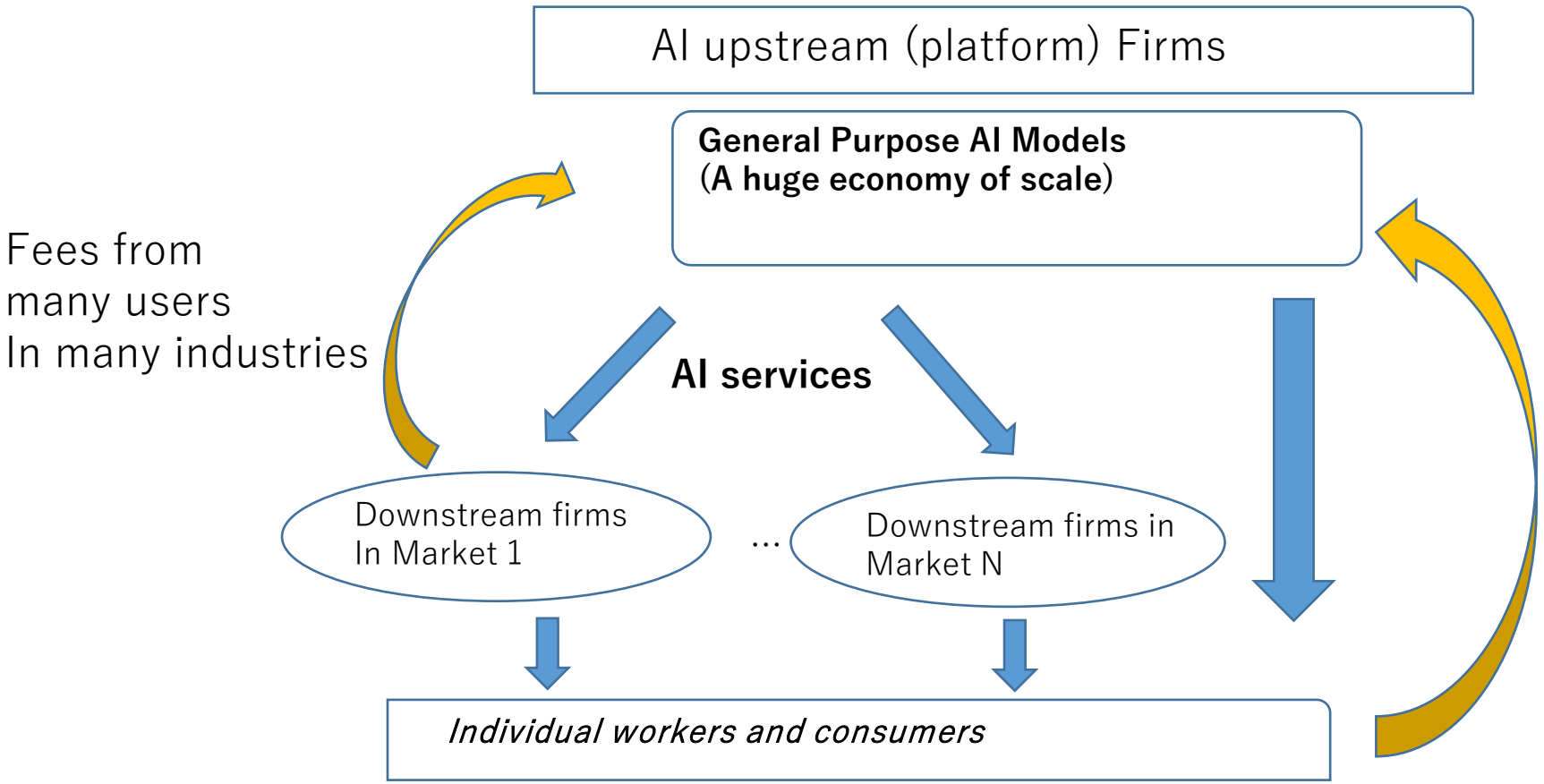
- Division of innovative labors exist in AI, due to huge economy of scale in developing a general purpose AI model and a large market.
- AI service of the upstream firm often plays an important role in AI innovations by downstream firms, which are the complement to the general purpose AI model.

 - Complementary R&D may achieve much higher performance, due to the improvement of general purpose AI.

 -Substitutable R&D or patenting by a downstream firm may become unnecessary and such AI investments made in the past may depreciate (bypassing occurs).

- Capturing these “spillover” could be important to assess the relationship between patents and innovations of downstream firms.

Figure 1 AI as a General Purpose Technology



Note. Other GPTs include Semiconductor, OS for PC and Phones, Internet Search. SNS platform

2. Assessing innovation performance of upstream firms in AI

- Upstream firms develop general-purpose AI models and provide the services based on such models. In this process they would exploit a wide spectrum of AI inventions. Thus, they use patents defensively to secure freedom in developing and implement their AI models (see the next slide for patent pledge by Open AI and for Shared AI License Foundation).

  -their performance depends on non-disclosed knowhow and information embodied in AI model, and patents may not predict them well.

  -Exclusivity is more important for downstream firms which develop solutions specialized for their product and service.

- Lee's paper seem to focus on downstream firms. We might need to have a different model for upstream firms.

Toward patent commons in AI model development?

- Open AI's patent pledge (February 4, 2025)

"We support the efforts of others in the use and development of AI model technology. We pledge to only use our patents defensively, so long as a party does not threaten or assert a claim, initiate a proceeding, help someone else in such activities against us, or engage in activities that harm us or our users."

- The launch of "Shared AI License Foundation" April 8, in 2026

"A new coalition of technology and innovation leaders has launched the Shared AI License Foundation (SAIL), the first organization dedicated to safeguarding AI innovation through a collaborative patent network. This initiative, led by founding board members Anthropic, Genentech (a member of the Roche Group), IBM, Meta, and Microsoft, and board observers eBay and TD Bank Group, creates a collaborative licensing zone for the development of AI foundation models."

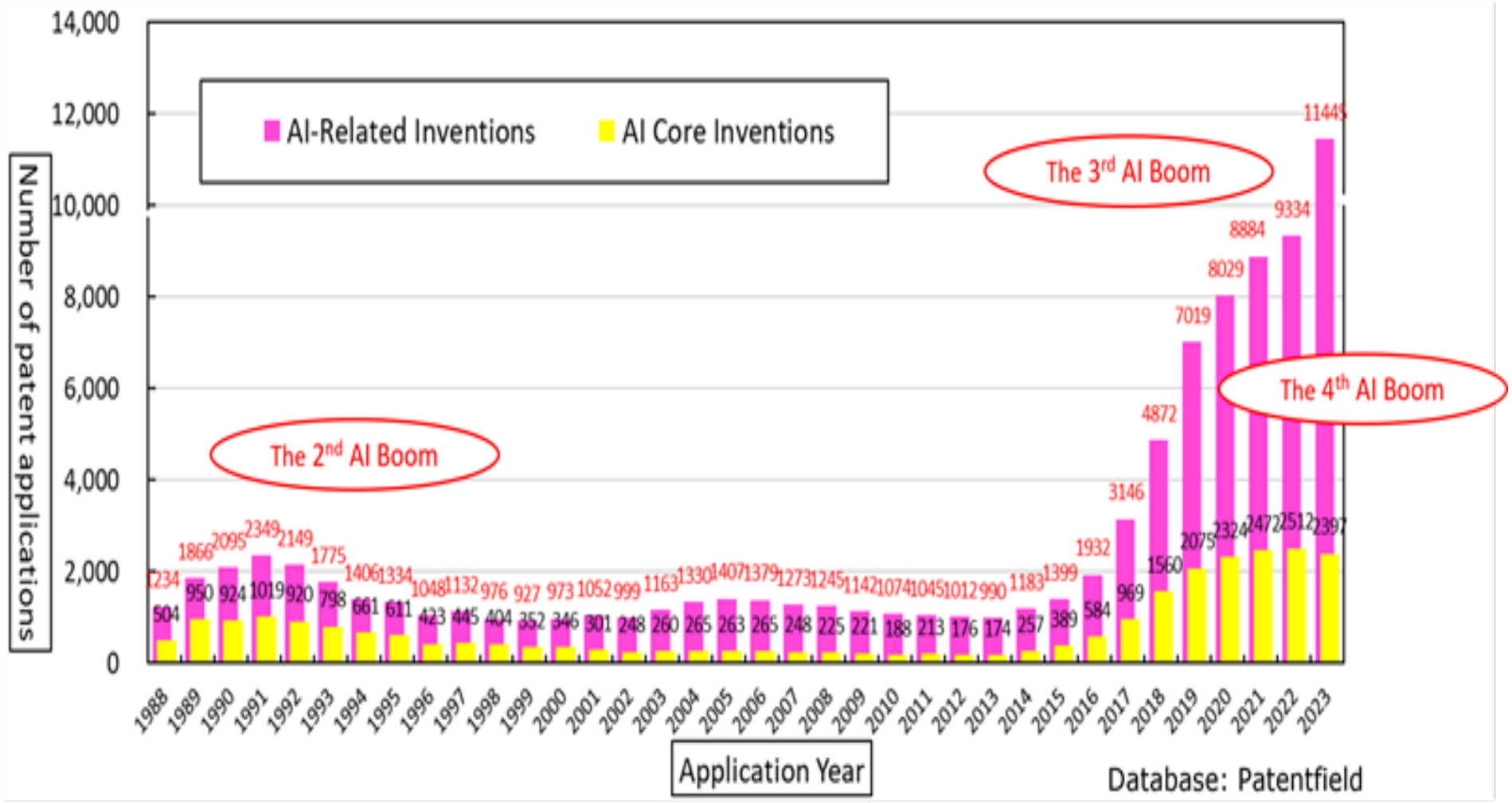
3. Using AI for identifying AI patents

- Past innovation research in economics used only bibliographic information but this research shows that we can go far beyond.
- Their new method applied large-scale language models on the titles and the abstracts of the US patents, to cover both the inventions advancing AI and the inventions using AI.

  -Their data clearly capture the impacts of the two major recent breakthroughs: deep learning in 2012 and transformer in 2017 (JPO data also supports that).

  - They discover many AI inventions across many technology fields
- How can we assess the new method, given that we have only a small number of AI patents identified by humans?

Figure 2. Trends in Patent Applications for AI-core and AI-Related Inventions to the JPO



AI Core Inventions: inventions on AI technologies themselves,
AI-related inventions: inventions that apply AI to various technical fields

4. Economic model for assessing the impact of AI innovations: two potential issues

- Since their model consider only AI patents, the coefficient of AI patents in their estimation can also reflect the effect of non AI patents. Since AI investment is likely to be a complement to the other R&D investment, perhaps over-valuation?
- In addition, a part of the R&D effect is due to AI.
- The paper also shows that productivity increases after the AI patenting by a firm, but the R&D investment would precede an AI patent while such investment is expensed immediately when it is implemented, so that the value added at the R&D stage is low. This could imply the increase of the value added productivity after the AI patent grant.