

Key Takeaways for “Tracing the Emergence of Extreme Ultraviolet Lithography: Lessons for Identifying, Protecting, and Promoting the Next Emerging Technology”

Extreme Ultraviolet lithography is the most important technology to have emerged out of the semiconductor industry in recent years. For U.S. policymakers interested in protecting and promoting the next emerging technologies of the future, EUV lithography's development in universities, national labs, and companies around the world offers important lessons.

This report presents a case study on EUV lithography's research and development trajectory throughout the last few decades, proposing an approach for identifying emerging technologies based on publication and investment data.

- **The EUV supply chain matured at different stages and remains globalized:**
 - ASML reportedly only makes 15 percent of its EUV lithography tools in-house, partnering strategically with firms worldwide to source components.
 - Companies active in the EUV supply chain are located in the countries that, earlier in the EUV research agenda, had active research communities.
 - EUV masks, photoresist, optics, metrology, and light sources are primarily supplied by ASML subsidiaries and firms in the United States, Japan, and Europe.
- **EUV appeared to be "emerging" as early as 1993, but decades of work ensued before commercialization:**
 - In the early 1990s, Intel invested \$200 million in EUV research, the first EUV public private partnerships started, and publication activity spiked.
 - Decades of work remained, however. Efforts to protect EUV development at that time would have been premature and risked slowing research progress.
- **It is possible to identify signs of technology emergence using bibliometric (publication and citation) and investment data:**
 - This data can also reveal specific researchers, labs, and corporations that are particularly competitive in a technology.
 - EUV's development shows that identifying an emerging technology in near-real time is challenging, and efforts to protect and promote emerging technologies come with trade-offs.

For more information:

- Download the report: <https://cset.georgetown.edu/publication/tracing-the-emergence-of-extreme-ultraviolet-lithography/>
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