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Artificial Intelligence and Competitive Dynamics in Downstream Markets

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More documentation related to this discussion can be found at: oe.cd/aidm.

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1. Introduction

1. On 4 January 2024, the Hungarian Competition Authority (Gazdasági Versenyhivatal, GVH) launched a market analysis to understand the impact of (generative) artificial intelligence (AI) on market competition and consumers. The study was published on 21 October 2024 and is available on the GVH's homepage.¹ It examines how AI is shaping, and is likely to impact, downstream market dynamics. This contribution summarises the main findings of the analysis.

2. About the market analysis

2. The market analysis aimed to explore the impact of generative AI on market competition and consumer behaviour. It also aimed to provide knowledge base for the GVH and its future work, identifying areas where the GVH can and should intervene and make proposals to stimulate competition or protect consumers.

3. The GVH collected data and information from a variety of sources. First, it reviewed relevant academic literature. Second, it sent out a request for information (RFI) to international technology companies and prominent generative AI model developers. This was done in order to obtain a comprehensive picture of their AI-related activities, and sales efforts, as well as the market structure, the existing competitive relationships, and the consumer protection practices of the respondents. In addition to international players, developers of Hungarian-language models were also interviewed.

4. To identify the downstream domestic business practices relating to the application of generative AI models, the GVH surveyed domestic market players in three predefined sectors likely to use AI technology and approached the Hungarian Chamber of Commerce and Industry (Magyar Kereskedelmi és Iparkamara, MKIK) for an overview of the economy. The GVH has also held several rounds of consultations with domestic research institutes, universities, and public and non-profit organisations to gain insight into domestic regulations, developments, and opportunities for small and medium-sized enterprises (SMEs) and larger companies.

3. Main findings of the analysis

5. The results of the market analysis mostly suggested that integrating generative AI-based solutions into business processes and products could be a critical factor for the future productivity and competitiveness of downstream companies. However, the current uptake is low, especially among smaller companies.

¹ https://gvh.hu/en/resolutions/sectoral_inquiries_market_analyses/market_analyses/examining-the-impact-of-artificial-intelligence-on-market-competition-and-consumers

3.1. Adoption of AI-based tools in the Hungarian economy

6. The MKIK recently conducted a survey of domestic companies regarding their use of AI. A total of 350 Hungarian companies employing at least 20 people were asked whether they use AI-based tools and, if so, for what purposes. They were also asked whether they had assessed the obstacles to implementing such new technologies.

7. Overall, the adoption of AI-based tools and solutions was low, only 12% of the companies indicated that they use such tools. Furthermore, only 22% of the executives indicated that they plan to use AI-based tools and solutions in the near future. Company size significantly impacts AI usage: while 21% of the large companies with 250 or more employees already use AI and a further 44% plan to adopt it, only 30% of smaller companies (especially those with 20–49 employees) plan to use such technologies.

8. Companies that use AI primarily use the technology for marketing (49%) and process automation (45%), but they also rely on AI for data analysis, content generation and product development. In cybersecurity, a quarter of companies use AI, whereas 20% use it for financial forecasting. The least common application areas are inventory management and logistics, and operating chatbots, for which the application rate is only 13%.

9. The biggest barrier to AI adoption is that 53% of the companies believe that these technologies cannot be integrated into their operations. A significant problem is also the lack of knowledge of the technology (46%) and competent expertise (48%). When asked about barriers to deploying AI, 35% of companies cited security risks and 33% cited excessive costs. Summarising responses based on business size, the biggest obstacles for large companies were, skills shortages (84%) and security risks (66%) while the most common obstacle cited by SMEs (53%) was that they did not consider the technology to be compatible with their operations.

3.2. Adoption of AI-based tools in specific sectors

10. In the telecommunications sector, seven out of 10 companies either responded that they do not use AI in their activities or do not use artificial intelligence solutions or cooperate with business partners in relation to AI applications and have no experience with artificial intelligence. Nevertheless, some companies reported that their employees regularly use OpenAI or familiarise themselves with OpenAI's Assistant service, which enables them to manage knowledge and become accustomed to machine learning-based solutions.

11. Companies indicated that artificial intelligence is used in various fields within the telecommunications sector. For example, it is used for customer service through virtual assistants, as well as for transcribing and analysing customer service calls. There are also examples on internal training platforms that can be filled with content to train colleagues mainly in the field of retail and customer services. Additionally, AI-based solutions are also used in areas such as quality assurance, fraud prevention (abuse identification), sales effectiveness (customer value management and sales process support) and efficient work organisation.

12. Regarding the banking sector, the GVH contacted a total of 21 banks operating in Hungary and certain other financial institutions in the banking sector. Nine out of the 21 banks replied to the GVH (the response was voluntary). Four of the respondents indicated

that they use some kind of AI-based solution in their domestic activities, while the same number of companies responded that they do not use such technologies.²

13. Based on the responses, it can be concluded that larger commercial banks typically use some form of AI-based solution, and that some of the companies involved in personal lending also use AI. Some players only use AI-based solutions to support internal, technical background operations, such as text digitisation and translation, while others have also implemented consumer-facing solutions.

14. Three of the respondents operated chatbots, while two used virtual assistant applications. The latter provide varying degrees of assistance; while some solutions help customers to find customer service channels more easily (e.g., information and options in the call centre menu system), others also enable a more optimal internal organizational functioning (e.g., virtual assistant that helps HR staff provide optimal responses).

15. Based on the responses received, it can be concluded that AI helps banks to develop and introduce new products and services, thereby stimulating competition among market players. In certain areas, the use of artificial intelligence can represent a particularly significant advance over traditional methods. For instance, it can help to prevent abusive, fraudulent, and malicious (fraudulent) banking operations, where, due to the legal obligation of instant transfers, only a very short period, just 1-2 tenths of a second, is available to analyse transactions. This suggests that acquiring knowledge and experience, as well as experimenting with tools, could be beneficial for these companies, enabling them to utilise AI-based tools for increasingly important tasks in the future. Conversely, SMEs, who generally utilise AI-based tools to a lesser extent, could potentially fall further behind.

16. Regarding the complexity of tasks assisted by AI, it can be said that so far only the somewhat less complex tasks have seen a surge in AI-based solutions so far. According to the responses received, it can also be concluded that, although while telecommunication companies and banks are using increasingly more AI-based solutions, these are often just assisting the workforce, while the leaving the core process of these tasks stayed unchanged.

4. Domestic developments in Hungary

17. To promote the use of AI-based solutions among Hungarian companies, particularly SMEs, there are several initiatives and developments available for those companies who are open and willing to apply these technologies.

4.1. Hungarian large language model developed by the Hungarian Research Centre for Linguistics

18. The Hungarian Research Centre for Linguistics has started developing basic and prompt-based models using external, open-source systems, which are then further trained in Hungarian. These models use the Llama architecture introduced by Meta. These models are primarily used to assist with administrative and customer support tasks. In terms of sales, they see a strong domestic interest, at the time being only from business customers, although they also see great potential in the areas of public administration and government (where (foreign) cloud services are not a realistic option due to data security requirements).

² One of the companies contacted indicated that although it has AI-based solutions at the corporate group level, the services provided to Hungarian customers are provided by a member of the corporate group registered in another EU Member State, so its bank registered as a branch in Hungary does not currently carry out any activities requiring a license.

However, they emphasise that it is unclear how well Hungarian large language models can meet market needs. Regarding the use of large language models in Hungary, no industrial-scale applications are currently known. Interested companies are rather in a preparatory phase.

19. To run and train their models, they require significant computing capacity. They believe that Hungary is currently far from having the capacity to produce large language models on an industrial scale. The pace of investment in capacity expansion and development lags behind global trends, although few players worldwide can compete with global developers. The main constraint on the development of Hungarian models is the lack of state funding, an outdated central strategy, and the lack of computing capacity. Nevertheless, Hungary's competitive position in the development of large language models is currently very good compared to the EU average. Large language models developed in national languages are rare in the EU, and these constraints are present in most EU countries.

4.2. Hungarian large language model developed by the OTP Group

20. Regarding downstream players developing their own solutions, OTP Group, the largest banking group in Hungary, is developing a GPT-3 language model. The company has built a system with significant computing power, enabling the training of large language models. They also collect the necessary data, on the basis of which monolingual (Hungarian) and multilingual (Hungarian and English) models are trained and conducted research in the potential applicability of these models. They also develop GPT architecture models among linguistic models, one of which is a Llama2 model adapted to Hungarian and trained with seven billion parameters, which has already been completed. The company also develops application methods, occasionally fine-tuning the models for this purpose.

21. The company intends to use the language models for a variety of tasks. One is to create knowledge-based systems that can extract relevant information from large text files based on questions, thanks to their text understanding capability, thus making workflows more productive. They will also be applied to general tasks where text generation capability and is important.

4.3. Services offered by government agencies

22. Since 2001, the Governmental Information-Technology Development Agency (KIFÜ) has been providing high-performance computing (HPC) services to higher education institutions and research centres. The Komondor supercomputer, which became fully operational on 1 August 2023, is currently available to users, along with the necessary software and full user support.

23. In 2020, KIFÜ established the HPC Competence Centre, which aims to promote and support the most efficient and effective use of supercomputing infrastructure. This includes HPC-related education, user support, community building and networking in Hungary and abroad.

24. While the HPC service is available to all SMEs in Hungary, certain conditions must be met to qualify, such as the nature of the SME's activity, the market situation it addresses, and the quality and type of service it wishes to develop. The maturity of the company's IT systems is taken into account as well. Based on KIFÜ's response, these criteria suggest that HPC use is most appropriate for innovative SMEs and start-ups that are research and development-oriented.

25. The HPC Competence Centre has been in contact with over 600 users and has run over 200 projects on Komondor. Nearly 50 SMEs and start-ups have reached a cooperation agreement, with a total of 27 SMEs and start-ups selected, primarily from the ICT, health, data, engineering and environmental sectors. They add that in general, the possibilities of using AI (not only for Hungarian-language models) are becoming increasingly accessible to everyone, including Hungarian SMEs, thanks to open-source development frameworks. According to KIFÜ, Hungarian SMEs are increasingly recognising the potential of AI; however further user support and education, as mentioned above, is needed for its widespread use.

5. Concerns in downstream markets

26. Firstly, the GVH considers it important that market players do not have unrealistic and inflated expectations of AI-based technologies. Of the market players that were contacted by the GVH, those using AI or generative AI solutions did not uniformly report sweeping and fundamental changes or impacts; rather, they reported smaller-scale and non-critical advances. This might change in the future, but it is difficult to predict.

27. However, based on relevant literature and professional forecasts, AI technologies are expected to develop rapidly and have the potential to substantially improve productivity and corporate efficiency. With regard to future risks in downstream markets, the productivity gap between large and small companies could widen further due to different rates of adoption of AI-based solutions. This could lead to increased market concentration, which is generally unfavourable for consumers, potentially resulting in higher prices, lower product quality and/or reduced innovation.

6. Suggestions

28. The results of the market analysis suggest that integrating AI solutions into business processes and products could be critical for companies' future productivity and competitiveness (although, for the sake of completeness, there are doubts about this). According to the results, smaller enterprises are less likely to use or attempt to use the technology.

29. To avoid further widening the productivity gap between large companies and SMEs, AI-based technologies must be made more accessible to a significant proportion of SMEs. This requires basic factors such as the ongoing development and updating of SMEs' technological knowledge, the availability of adequate capital and the provision of competent staff, preferably through higher education training. More access to supercomputing capacity should also be provided for the SME sector. Without the widespread provision of these essential factors, the SME sector will be unable to move progress, despite public support programmes now making critical development infrastructures available to SMEs.

30. Regarding language models, while quality is high for widely spoken languages, this may not be the case for smaller languages. The OECD's 2023 study³ and the information obtained by the GVH during the market analysis also support the direction that the development of Hungarian-language AI technology is not only appropriate, but also

³ **OECD (2023):** *AI language models. Technological, socio-economic and policy considerations*. Paris, OECD Publishing. /OECD Digital Economy Papers, 352./ <https://doi.org/10.1787/13d38f92-en>

important. The development of Hungarian language models contributes to product diversity, which ultimately improves consumer welfare in the long term. This is because there are areas where the quality of the AI model depends on an understanding of the language, for which training in that language is essential.