Leveraging ICT-enabled services for Trade in Times of Pandemic: the case of AI-enabled health services

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Executive summary

The backbone of the digital economy, Information and Communication Technologies (ICT) played a prominent role during the COVID-19 pandemic. Among the emerging technologies spearheading the rise in ICT-enabled services is Artificial Intelligence (AI), whose application in the health services sector may prove to be key to mitigating the impact of potential future international health crisis.

However, for AI potential in health services to be fully exploited and for trade in AI-enabled health services to be facilitated in time of greater need (e.g. during a pandemic), governments must address a number of concerns relating to the access, quality and management of the large volumes of data necessary for AI to properly work, the functioning of AI systems and the lack of international technical standards on AI-enabled services, as well as computing power underlying the use of AI.

The disruptive nature and the peculiar characteristics of artificial intelligence may justify the adoption of an AI-specific trade policy approach in order to address the vast majority of these concerns. In particular, this would entail introducing in international trade agreements disciplines on technical standards for the cross-border trade of AI-enabled services, promoting the transfer of knowledge to reduce the digital divide in AI, and facilitating the conditional access to data across borders for AI-related purposes in time of international health crisis. Issues related to the quality and reliability of the IT infrastructure could be remedied through the adoption of non-AI-specific measures.

Information and Communication Technologies (ICTs)

Information and Communication Technologies (ICT) services are the backbone of the digital economy. Best described as directly involving the production and/or use of ICTs , they include 'ICT services' as final outputs (e.g. telecommunications services, computer and information services) as well as 'ICT-enabled services', i.e. services delivered remotely over ICT networks for which ICTs are thus critical inputs.[1] Potentially ICT-enabled services include financial services, research and development services, professional and management consulting services, audio-visual and related services, health services, and education services.[2] In the digital era the production of a variety of services, including ICT services, has become increasingly independent of location, new services are being created, and the tradability of many services activities is on the rise.[3]

During the COVID-19 pandemic ICT services have played a prominent role. As governments started imposing traveling bans and social distancing measures in order to prevent the virus from spreading both within and across borders through human proximity and alleviate the pressure on the healthcare systems struggling to cope with the outbreak, firms and the public sector alike resorted to adopting a smart-working approach and digital solutions to minimize the disruptive impact these restrictions would have on employment, global value chains and

[1] Nath, N. K., and Liu, L. (2017). 'Information and communications technology (ICT) and services trade'. *Information Economics and Policy*, 41, pp. 81-87; and UNCTAD (2015), International Trade in ICT Services and ICT-enabled Services. [Online]. Technical Notes for Development N. 3, TN/UNCTAD/ICT4D/03. Available at: https://unctad.org/en/PublicationsLibrary/tn_unctad_ict4d03_en.pdf (Accessed: 24 July 2020).
[2] OECDa (2020). Handbook on Measuring Digital Trade. Paris: OECD..
[3] OECD (2006). 'ICT-enabled Globalisation of Services and Offshoring, in OECD Information Technology Outlook 2006. Paris: OECD.

goods and services production. With the transition to remote work and the increasing reliance on the digital medium, ICT services and ICT-enabled services boomed.

Artificial Intelligence (AI)

Among the emerging technologies spearheading the rise in ICT-enabled services is Artificial Intelligence (AI). A collection of technologies that combine data, algorithms and computing power, AI enables the performance of tasks usually reserved for human cognition, i.e. recognizing patterns, predicting outcomes clouded by uncertainty, and making complex decision.[4] First conceptualized in the early 1950s, it is only in the last decade that significant advances in data processing power, growth of computing infrastructure and the emergence of new conceptual approaches (e.g. neural networks and deep learning) have enabled an increasingly substantive and widespread application of AI.[5]

Initially designed to overcome simpler and narrower problems like language recognition and image retrieval through pattern matching (known as 'weak AI'), AI is getting increasingly sophisticated at mimicking human intelligence, solving complex problems more efficiently, rapidly, and at a lower cost.[6] Nevertheless, there is still a long way to go to before machines may understand the world around them as humans can (i.e. Artificial General Intelligence).

Artificial intelligence is most commonly associated with machine learning (ML), the ability of computers to learn and extract meaningful patterns from available data without having to be explicitly programmed.[7] But AI technologies can also rely on deep learning (DL), a computer architecture inspired by the human brain, with neurons and connections that allow machines to solve complex systems using multiple layers to extract meaningful representations from raw data.[8]

AI-enabled services

AI technologies can be applied in a wide variety of sectors. Headline-worthy examples include autonomous vehicles, AI-assisted robotic surgery, facial recognition and personalized advertising in social media platforms. With the outbreak of COVID-19, however, attention started to shift towards the potential application of AI technologies and tools to services sectors of particular relevance in times of pandemic, including banking, education and, most importantly, health services.

The speed at which AI processes information can be particularly useful in the banking sector when access to credit can make or break a business. Social-distancing measures and travel bans issued by governments in an attempt to decelerate the spread of the virus caused massive disruption in the private sectors, leaving many companies, especially small- and medium-sized enterprises (SMEs) operating in the tourism, restaurant and entertainment business, at risk of shutting down. In an attempt to offset this threat of closure, many firms resorted to asking for

[4] European Commission (2020). *White Paper on Artificial Intelligence - A European approach to excellence and trust*. COM(2020) 65 final, pp. 1-27; and Lee, K-F. (2018), The Four Waves of AI. [Online] Fortune. Available at: https://fortune.com/2018/10/22/artificial-intelligence-ai-deep-learning-kai-fu-lee/ (Accessed: 24 July 2020).
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[6] Dananjanyan,S. and Raj, G. M. (2020). 'Artificial Intelligence during a pandemic: the COVID-19 example. *International Journal of Health Planning and Management*, pp. 1-3.
[7] Pham, Q. et al. (2020). Artificial Intelligence (AI) and Big Data for Coronavirus (COVID-19) Pandemic: A Survey on the State-of-the-Arts. *Preprints*, pp. 1-17; and Taulli, *op. cit.*, 2019.
[8] Lee, *op. cit.*, 2018; and Pham et al., *op. cit.*, 2020.

loans, leading to a massive surge in requests for credit. This in turn induced several banks to accelerate the adoption of AI to process the vast amounts of data necessary to expedite loans approvals.[9]

Education services in times of pandemic, when teachers cannot hold in-person classes due to social-distancing measures, could also benefit from AI technology. Artificial intelligence can facilitate education by enabling students to engage with their teachers and professors irrespective of their location, and access learning materials from anywhere. Also, AI-based platforms allow for professors to virtually monitor their students' progress.[10]

Though banking and educational services could greatly benefit from AI technologies, the COVID-19 crisis highlighted how the use of artificial intelligence can be especially effective in the healthcare sector.[11] Machine learning algorithms can identify patterns through millions of data points on a local population, risk factors and treatment effects, a task that a human team will find physically impossible to undertake.[12] Also, besides official data, AI can gather information from other sources like news outlets, forums, healthcare reports, travel data, social media posts, and the like in multiple languages across the world by using natural language processing (NLP) techniques and flag their priority, thus extending the range of data available for analysis.[13] ML-based AI applications allow unprecedented insights into early detection of diseases, image diagnostics, healthcare processes, treatment variability and clinical research for the development of vaccines, all instrumental in the fight against pandemic-prone diseases like COVID-19.[14]

Health services can greatly benefit from the shorter timeframe and greater range of data that AI can process in comparison to what humans can do.[15] For example, AI can help reduce the cost and time involved in analyzing scans, potentially allowing more scans to be taken to better target treatment.[16] Case in point is an AI diagnostic tool designed to analyze patients' chest CT scan images that was successfully used in Wuhan to distinguish COVID-19 from other types of pneumonia within seconds.[17] Considering how crucial timing can be when fighting a virulent pandemic like COVID-19, it is unsurprising that medical staff shortages and extraordinary

[9] Chen, J. (2020). Technology Companies And Startups Will Help Every Sector Emerge Stronger From The Pandemic. *Forbes*, [online]. Available at: www.forbes.com/sites/forbestechcouncil/2020/07/15/technology-companies-and-startups-will-help-every-sector-emerge-stronger-from-the-pandemic/ (Accessed 24 July 2020).

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[13] Dananjanyan and Raj, *op. cit*., 2020.

[14] Dananjanyan and Raj, *op. cit.*, 2020; OECDb (2020). Using artificial intelligence to help combat COVID-19. [Online]. OECD Policy Responses to Coronavirus (COVID-19). Available at: www.oecd.org/coronavirus/policy-responses/using-artificial-intelligence-to-help-combat-covid-19-ae4c5c21/ (Accessed: 24 July 2020); and Vaishya, R. et al. (2020), 'Artificial Intelligence (AI) applications for COVID-19 pandemic'. Diabetes & Metabolic Syndrome: Clinical Research & Reviews, 14(4), pp. 337-339.

[15] Mohammad, *op. cit.*, 2020; and ZME Science, *op. cit.*, 2020).

[16] Nuffield Council of Bioethics (2018), Artificial Intelligence (AI) in Healthcare and Research. [Online] Bioethics Briefing Note. Available at: www.nuffieldbioethics.org/assets/pdfs/Artificial-Intelligence-AI-in-healthcare-and-research.pdf.

[17] Dananjanyan and Raj, *op. cit.*, 2020.

influxes of patients experienced by hospitals at the height of the crisis prompted a surge in AI adoption in health services in numerous countries.

Challenges to trade in AI-enabled health services

However, for AI potential in health services to be fully exploited and for trade in AI-enabled health services to be facilitated in time of greater need (e.g. during a pandemic), governments must address a number of concerns relating to the access, quality and management of the large volumes of data necessary for AI to properly work, the functioning of AI systems and the lack of international technical standards on AI-enabled services, as well as computing power underlying the use of AI.

AI depends on digital data, which are used to train AI algorithms and to identify and analyze patterns. The lack of data exchanges and the unavailability of good health data limit the ability of AI technology to address health crisis like the Covid-19 pandemic.[18] Limited access and inadequate quality of available data may lead to AI inefficiencies that, in turn, can negatively affect the performance of AI-enabled services to the point of potentially putting the life of patients at risk. For example, doctors relying on AI technologies to treat patients (e.g. image diagnostic services) may potentially misdiagnose people with rare medical conditions, or others who are underrepresented in clinical trials and research data (e.g. minority ethnic populations), when poor data used for training ML-based AI systems or when data are scarce or more difficult to collect or render digitally.[19] A likely significant contributor to the limited availability of adequate data is the plethora of measures restricting cross-border data flows (e.g. data localization requirements) adopted by numerous countries in the last two decades.[20] Another is the lack of standard datasets, potentially affecting the accuracy of AI algorithms in their application to healthcare clinical research and predictive analysis.[21]

The use of AI technologies in healthcare also sparks concerns on data privacy and security.[22] AI-enabled health services rely on the acquisition and processing of sensitive personal data (e.g. genetic data, racial and ethnic data), whose access and treatment for public health purposes (like in the case of a pandemic) may be already regulated at national or regional level under data protection laws.[23] However, AI algorithms have the ability to find patterns between seemingly non-personal and anonymized data that can result in the reconstruction of a person's identity, thus challenging the capacity of existing domestic regulations to protect the privacy and

[18] Sudipto, Ranjit, and Jonali, *op. cit.*, 2019.
[19] ZME Science, *op. cit*., 2020; and Nuffield Council of Bioethics, *op. cit*., 2018; and Fenech, M., Strukelj N., and Buston O. (2018). Ethical, Social, and Political Challenges of Artificial Intelligence in Health. [Online]. Future Advocacy. Available at: https://wellcome.ac.uk/sites/default/files/ai-in-health-ethical-social-political-challenges.pdf (Accessed: 24 July 2020).
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[23] See for example General Data Protection Regulation (GDPR) of the European Union.

personal data of said individual. This is a problem that occurs especially when AI systems scrape data from public sources.[24]

The internal functioning of AI algorithms is also cause of concern for the deployment of AI technologies in the health services sector. It is generally difficult to understand the underlying logic that generates outputs in machine learning applications. This lack of transparency about how AI algorithms actually work and produce their results is commonly known as 'the black box'.[25] For AI-enabled services the 'black box' represents a massive liability and may heighten the risk of misdiagnosis, error, or biases. Doctors need to be able to explain why and how they came to a diagnosis, irrespective of the technology they use to come to a specific medical decision. The EU attempted to address this problem through its data protection regulation, by granting the GDPR data subjects the right not to be subject to a decision based solely on automated processing.[26] However, no internationally agreed standard imposing human oversight or explicitly programmed ruled-based expert systems currently exist to limit the risks posed by the 'black box' in AI-enabled health services.

Issues with the quality and reliability of the ICT infrastructure may as well affect the supply of AI-enabled services within and across borders. AI systems require significant computing power, scalable storage capacity, high bandwidth and low latency networks to analyze large and complex datasets.[27] Limited broadband infrastructure, high cost of access to the IT infrastructure, caps to data usage, and disruptions to the semiconductor supply chain due to the trade war between the United States and China can all contribute to limit the ability of health services suppliers to use emerging technologies like AI.

Artificial Intelligence in RTAs

Governments have started to explicitly acknowledge that trade agreements have a role to play in regulating artificial intelligence. The Digital Economy Partnership Agreement (DEPA), recently signed by Chile, New Zealand and Singapore, includes a provision specifically dedicated to AI, the first ever RTA to do so.[28] Article 8.2 calls for the adoption of ethical and governance frameworks supporting the trusted, safe and responsible use of AI technologies that should take into account internationally recognized principles such as transparency, fairness and human-centred values. Although framed as best-endeavour language, Article 8.2 DEPA signals an acknowledgement of the increasingly widespread use and adoption of AI technologies in the digital economy and the need to ensure the safety and trustfulness of AI-enabled good and services traded across borders.

The United Kingdom (UK) also acknowledges the importance of regulating emerging technologies like AI. Its proposed text for a comprehensive free trade agreement with the EU includes a provision calling for cooperation between the Parties on regulatory and non-regulatory issues related to emerging technology (e.g. AI, blockchain, quantum technologies, immersive technologies and Internet of Things) and the importance of developing standards

[24] Taulli, *op. cit.*, 2019.
[25] Fenech, Strukelj, and Buston, *op. cit.*, 2018.
[26] See GDPR Article 22.
[27] Hofstee, E. (2019). What are the infrastructural requirements for Artificial Intelligence?. [Online]. Leaseweb Blog. https://blog.leaseweb.com/2019/07/04/infrastructure-requirements-ai/ (Accessed: 24 July 2020); Sudipto, Ranjit, and Jonali, *op. cit*., 2019; and Molnár-Gábor, *op. cit*., 2020.
[28] See Article 8.2 DEPA.

that uphold and promote the Parties' mutually held values of liberty, equality and dignity, and promoting public trust in the development and deployment of emerging technology.[29]

Other RTAs include provisions that indirectly regulate trade in services enabled by AI. For example, the Comprehensive Partnership Trans-Pacific Partnership agreement (CPTPP) contains disciplines on data flows and data localization requirements whose primary objective is to regulate cross-border access to data, a key input for the functioning of AI technologies and relevant applications in the services sector. The draft text of the Chapter on Digital Trade of the FTA between the EU and New Zealand, on the other hand, includes a provision recognizing the protection of personal data as a fundamental right, which may also affect the ability of suppliers of AI-enabled services to access and process data of EU subjects.

Policy recommendations

The COVID-19 experience has shown that deploying AI in healthcare services could be instrumental in fighting future pandemics. However, exploiting the full potential of AI requires governments to ensure that, irrespective of the origin of the health service supplier, AI systems can be safely employed in healthcare without needlessly endangering the life of patients. Although a number of existing RTAs contain disciplines that may affect trade in AI-enabled health services (e.g. provisions on data flows, general exceptions for privacy and human health protection), the disruptive nature and the peculiar characteristics of artificial intelligence may justify the adoption of an AI-specific trade policy approach.

Priority for action should be given to remedy the absence of internationally agreed AI-specific standards for AI-enabled services to be traded cross-border. For this purpose, governments should:

- identify criteria for determining the safety and trustworthiness of AI systems and algorithms used in the supply of services across the border. This may include requirements for mandatory human oversight or explicitly programmed ruled-based expert systems currently exist to limit the risks posed by the 'black box' issue;
- foster regulatory cooperation for the establishment of commonly agreed AI-specific technical standards that aim at protecting human health from potential AI-related biases and errors without acting as unnecessary barriers to trade in AI-enabled services.

Leveraging AI-enabled health services in time of pandemic also requires policymakers to strive to reduce the digital divide, in order to ensure that all countries, irrespective of their income level, can take advantage of the benefits accruing from a more widespread use of AI technologies in healthcare. This may entail:

- Facilitating the transfer of knowledge from AI-leading countries to trade partners that still lag behind in AI research and development, for example by introducing rules for the mandatory transfer of knowledge on AI in time of international health crisis;
- Promoting technical cooperation specifically aimed at increasing AI capacity in lower income countries and ensuring that, especially in case of future pandemics, the latter can safely deploy AI technologies in the health sector.

To help facilitate the use of AI in times of international health crisis, governments should also address the concerns surrounding the access to personal and non-personal data by AI systems.

[29] See Article 18.18 of the Draft Working Text for a Comprehensive Free Trade Agreement Between the United Kingdom and the European Union, 2020.

Governments could introduce specific disciplines on data flows granting temporary increased access to public and private scientific and medical databases by AI-enabled health services suppliers in times of pandemic, for example by mandating the temporary removal of data localization requirements or the easing of data protection regulations. These disciplines should include criteria for data access that reflect the need to protect public health without excessively encroaching on individuals' right to privacy and personal data protection. These criteria could comprise, but not be limited to:

- Duration of removal of data localization requirements or easing of data protection regulations;
- Type of AI-enabled services sectors for which increased access to data is granted (e.g. image diagnostic services, clinical research services);
- Purpose of increased data access (e.g. enlarging training data pool to improve AI performance; diversifying data to decrease potential biases and errors), with bans or restrictions on re-use of accessed data for other purposes;
- Type of data to be accessed.

Other non-AI specific measures aimed at fostering digitalization and ICT-enabled services in time of international health crisis may complement the policy actions described above. This could include:

- adopting measures against price inflation for data services;
- promoting tele-health;
- removing caps on data usage;
- reducing cost of access to the IT infrastructure; and
- banning tariff increases on essential IT components like semiconductors.

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