© Ipopba-AdobeStock

B. Business Impact

Market regulation and disruptive innovation: The case of Artificial Intelligence

ESCP Impact Paper No.2023-07-EN

Diego ABELLÁN MARTÍNEZ
ESCP Business School

ESCP RESEARCH INSTITUTE OF MANAGEMENT (ERIM)

Market regulation and disruptive innovation: The case of Artificial Intelligence

Diego Abellán Martínez*

ESCP Business School

Abstract

Disruptive innovations are outside the current rules. Some of these innovations arise in regulated markets and challenge the regulation in force, such as ride-sharing transportation, electricity generation, and hospitality. When innovation grows faster than regulation, the discussion is whether it should be regulated and to what extent. The most relevant disruptive innovation in this category is artificial intelligence ("AI"). It will potentially affect all sectors and people's lives. While AI improves productivity and makes processes more efficient, it is associated with significant risks: 1) It will negatively affect the labor market, potentially increasing income inequality within and across countries, 2) the use of AI can provide biased and discriminating results, and 3) users' misconduct can influence people decisions. This paper argues that global regulation has to adapt in response to AI challenges. Markets cannot autoregulate, and government intervention is necessary to control and mitigate the risks associated with AI. As it occurs with nuclear power, this regulation needs global coordination to promote AI's safe, secure, and peaceful use. Otherwise, countries individually have incentives to apply loose laws to compete and attract AI investment opportunities.

Mots clés (keywords): Regulation; Disruptive Innovation; AI

*Global Executive Ph.D. candidate, ESCP Business School

Market regulation and disruptive innovation

I. Relationship between disruptive innovation and regulation

Technological change through innovation is essential for long-term economic growth (Barro and Sala-i-Martin, 2003). When companies are evaluating investing in innovation, regulation matters. Studies analyze aspects of regulation that potentially affect innovation activity and find that government regulation is not neutral: Labor market regulation, such as employee firing limitations or higher costs related to firms' size, affects the innovation environment. Acharya et al. (2013) find that labor laws limiting employee dismissal positively affect innovation, encouraging firms and their employees to pursue these activities. Aghion et al. (2021) analyze the effects of labor regulation on innovation using the threshold for French companies with more than 50 employees, where costs increase substantially. The authors find that those costs discourage companies below the threshold from investing in innovation. This reduction in innovation is related to incremental R&D, but those firms below the threshold still pursue radical innovation that creates significant value if they succeed.

Disruptive innovations generate a debate about regulation. Discussants in the OECD Competition Committee meeting in June 2015 agreed that disruptive innovations have two characteristics: 1) the potential to alter the market functioning; and 2) the emergence of a new business model (OECD, 2015). Therefore, disruptive innovations affect companies' competitive strategies, the labor market, and the relationships between agents (customers and suppliers of goods and services).

In regulated markets, disruptive innovations go against the pillars of established regulations proposing a change in the business model. The regulation constrains incumbents' business models in these environments, and new competitors bring new models by providing solutions "*out of the current regulatory framework*". We can observe how ride-sharing services using internet-based technology, battery storage in electricity generation, or home-sharing accommodation in hospitality have changed the rules of the game and opened the discussion about regulation.

In some cases, disruptive innovations have grown faster than regulation and generated a discussion about the costs and benefits of regulating innovation. Artificial Intelligence ("AI") has emerged as this category's most significant disruptive innovation because it will profoundly affect the market structure of all industries and people's lives. Kaplan and Haenlein (2019: 15) define AI as "a system's ability to correctly interpret external data, to learn from such data, and to use those learnings to achieve specific goals and tasks through flexible adaptation". AI is already transforming companies' business models. In a recent interview, IBM's CEO estimated that AI could replace thirty percent of the task force (7,800 jobs). Briggs and Kodnani (2023) estimate that the new wave of AI automation could be equivalent to 300 million full-time jobs. However, not all of the automation would result in layoffs because a portion of the jobs is partially exposed to automation, and in those situations, AI would be complementary. The question is whether AI should be regulated and to what extent. Governments have a difficult task: Improve efficiency through maximizing AI's home-grown products and, at the same time, minimize the adverse effects of this technology.

This paper analyzes whether regulation should be adapted in response to AI challenges. Contrary to the belief of market self-regulation, government intervention is necessary to limit the adverse effects of AI. A well-implemented regulatory process is crucial to prevent

the harmful effects of AI and, at the same time, not penalize AI's positive impact on home-grown products. This paper also discusses the advantages of global compared to local regulations. So far, countries have made individual efforts to avoid the harmful effects of AI. The main concern with local laws is governments' incentives to issue loose regulations competing for AI activities, thus limiting the efficiency of those policies. AI regulation needs global coordination among countries to promote AI's safe, secure, and peaceful use.

II. Theories of market regulation

Regulation is related to government intervention through taxes, subsidies, administrative legislation, and control mechanisms to implement social-economic policy objectives. Regulation can be distinct between economic and social. Economic regulation deals with monopolistic and imperfect markets and social regulation is mainly related to the environment, healthcare and safety, and labor.

It is under debate whether government intervention improves welfare. According to the *public interest theory*, governments efficiently intervene in the markets (control prices, regulate the job market, etc.), increasing social welfare. The simplest form of the "*public interest*" or "*helping hand*" theory assumes that markets operate inefficiently, regulators have all the information, and intervention is costless. The more advanced theory recognizes transaction and information costs but argues that regulation improves market efficiency compared with markets with failures.

Stigler (1971) and Posner (1974) developed a theory contrarian to the conventional wisdom of efficient government intervention. They proposed that regulation is subject to the market forces: interests of the affected groups (demand) and legislators and regulators (supply). A central thesis of this theory is that the industry can capture regulation and designs it for its own benefit. This theory predicts that regulation will finally promote the industry's interests even if governments pursue the public interest, as firms in the industry can organize as an effective coalition to obtain the benefits of public regulation. Therefore, implementing regulations such as barriers to limit the entrance of new competitors would have no positive effect on social welfare. Also, when markets do not work perfectly, private enforcement through courts should correct these situations. This theory has strong confidence in well markets' functioning and enforcement actions.

There are several aspects to consider in AI regulation. The first question is whether markets can autoregulate. If the markets can autoregulate, no government intervention is required. In case markets cannot autoregulate, evaluating the benefits and costs of regulation is also relevant because market regulation is not a costless mechanism that governments can use in any circumstance. For example, governments have issued regulations to limit rental prices to control rising costs and escape from an unaffordable housing market, but empirical studies show that regulations had opposite results to the government goals. Diamond et al. (2019) find that rent control expansion in 1994 in San Francisco resulted in a long-run reduction in the supply of rental housing and increased rents. An additional aspect to consider is who receives the benefits of regulation. Interest groups may lobby governments to capture the benefits of the regulation. For example, Justo-Hanani (2022) analyzes the AI regulatory process in the EU and argues that the regulatory outcome (still in process) is being influenced by powerful domestic actors, mainly large corporations and economic interest groups.

Consequently, governments must define and implement policies to prevent AI's harmful effects and, at the same time, not negatively affect AI home-grown products. This

equilibrium is difficult to achieve in a regulatory process with a complex and evolving environment, where policymakers need continuous feedback from interest groups acting on their own interests.

III. Artificial Intelligence and Regulation

It is well-accepted that competition is the best mechanism to improve welfare through price reductions and quality improvements. Regulation is required when markets' autoregulation results in suboptimal results, which occur in imperfect or monopolistic markets, or when autoregulation negatively affects the environment, healthcare and safety, and labor. However, regulation is not costless, and governments need to evaluate the net effects of the regulation to ensure that it improves welfare.

AI is among the greatest challenges posed to governments. AI has so many applications that are expected to change people's lives. However, AI also has relevant costs. Haenlein and Kaplan (2019) discuss risks associated with the use of AI: The system's potential bias and difficulty in evaluating the algorithm («black box»), the negative effect on the labor market due to the automation of processes, and the governments' misused of AI (who will guard the guards?).

The main risk factors to consider in the decision to regulate AI are:

Impact on the labor market: AI is a disruptive technology across industries and society. Using AI to automate processes will potentially affect every sector of the economy. AI can perform routine tasks, primarily related to manufacturing processes and non-routine cognitive tasks that affect high-skilled jobs, such as lawyers, engineers, or accountants. The main concern with using AI is the potentially massive layoff generated by substituting workers with the technology. The negative effect of AI on the labor market may not be homogeneous. High-skilled workers have more options to adapt to new technology and use AI as a complementary tool to improve productivity, which would not be the case for «white-collar» workers. Therefore, the application of AI may generate not only high unemployment levels but also a higher income inequality gap. Acemoglu and Restrepo (2022) document that, between 1980 and 2016, the relative wage decline of US workers with routine jobs is mainly driven by automation, explaining a significant portion of the rise in US wage inequality during the last four decades.

This gap could also be more significant due to two additional factors: 1) The difference between shareholders' return and labor share, and 2) the higher impact of automation in emerging countries. An increase in productivity would improve firms' profitability, and the increase in pure profits would retribute capital instead of labor share increasing income inequality. Also, it may generate cross-countries inequality. Emerging economies have production cost advantages compared with developed economies. Automation of processes with robots would dilute emerging countries' competitive advantage. Using an analytical model, Alonso et al. (2022) find that improving robots' productivity would shift investments to more advanced economies where automation is already established, damaging developing economies' labor market and growing divergence between economies.

Algorithms with bias: AI also has other potential adverse effects on society: AI algorithms may contain bias in their design. One case with the harmful effects of biased algorithms occurred in the Netherlands. The Dutch tax authority developed an algorithm to create risk profiles of individuals applying for childcare benefits in which foreign-sounding names and dual nationalities were set as risk factors. The algorithm provided a higher score to those

individuals in a black box system, and civil servants, which could not evaluate why those individuals had higher risk scores due to the "black box", continued the process without additional validations. Consequently, thousands of racialized low and middle-income families were falsely accused of fraud and required to return the benefits legally received. On May 5, 2022, the Dutch government admitted for the first time that institutional racism was the root that caused the scandal (European Parliament, 2022).

Additionally, the algorithm's black box does not prevent society from suffering from monopolistic behavior. Algorithms can also affect competition and reduce welfare. The algorithm may find that oligopolistic or monopolistic equilibrium is the best solution and set decisions to reduce competition, increase prices, or reduce the quantity. It may define strategies to destroy competitors even when it is in an early stage and is not a threat.

Even if the algorithms are properly implemented, the lack of transparency can generate distrust. One of the well-known examples is the Apple card. Apple and Goldman Sachs launched the Apple card in August 2019. Goldman Sachs was responsible for the credit policy and underwriting decisions. A few months after the launch, the Department of Financial Services of the New York State investigated allegations of discrimination against women in Apple Card underwriting due to bias in the algorithms and machine learning to set credit scores and credit terms. While this news raised alarms about AI bias, the investigation found no evidence of unlawful discrimination.

While regulation will have associated compliance costs, it will be necessary that regulators monitor and control the algorithms.

Harmful use of AI: Finally, Geoffrey Hinton, one of the pioneer developers of AI, has highlighted the risks of a strong influence on people's decisions. Under misuse, this technology can be utilized to manipulate people to vote for one party, risking the concept of democracy (Taylor and Hern, 2023). With AI technology, "bad users" can disseminate information more effectively, identifying the audience, the timing, and the right channel to affect the will of voters. Government intervention is needed to mitigate this risk.

AI will be a key factor for companies' competitive advantage. Governments need to provide the right environment for AI development and, at the same time, ensure that it is a trustworthy technology. Regulating AI is challenging because the technology is complex and continues evolving. Governments must control risks mainly by two mechanisms: 1) issuing administrative legislation and 2) monitoring AI's activities by creating specialized AI supervisory bodies.

IV. Current steps in the regulation of AI

The current debate concerns using data and complex algorithms to improve their products/services and support decision-making. We are still in the early days of AI regulation. Governments are at different stages in regulating AI without a global approach or coordination.

The EU is aware of the relevance of AI in achieving long-term economic growth and has worked on a roadmap to develop the environment and, at the same time, the regulation to provide clarity to agents. In 2018, the EC started this work by setting up a group of AI experts through alliances with diverse stakeholders. In 2021, the EC proposed an AI Act, which is currently under review for approval by the European Parliament. The EC proposal determines the level of risk of AI systems by classifying them into three categories: unacceptable, high, and low/minimal risks.

In 2022, EEUU started regulating-specific AI cases. For example, some states, including California, Illinois, New York, Washington, and Maryland, regulate the use of AI screening tools in recruitment to ensure that the application of AI does not generate gender or ethnic bias. In the case of New York, companies using automated employment decision tools (AEDTs) are required to conduct a bias audit every year. Regulation is expected to move from specific cases to general obligations to AI users. In October 2022, as a first step in AI general regulation, the US government published a non-binding guide to AI development, the AI Bill of Rights (White House Office of Science and Technology Policy, 2022).

Other countries such as China, the UK, Australia, and Japan are also working on regulating AI activities. While countries are working to limit the harmful effects of AI without damaging innovation, there is no global strategy yet.

Conclusions

AI is the most relevant disruptive innovation, potentially affecting all industry dynamics. AI's capacity to perform routine and non-routine cognitive tasks generates high expectations of productivity improvements. AI has an extraordinary capacity to collect and treat data and support decision-making, from monitoring workers' productivity to identifying and evaluating the best job candidates. It also has relevant costs. The main costs are associated with the potential bias and discrimination of the algorithms, the adverse effects on the labor market, and agents' misconduct to influence people's decisions. The question is whether AI should be regulated and to what extent.

The AI regulatory bodies will have to establish the speed of AI adoption, potentially protecting strategic industries and ensuring that all companies within the industry have the same opportunities to use the technology to compete. Can AI harmful effects be controlled by applying domestic regulations? Should government coordinate global actions?

We can use the comparison with nuclear energy to address the need for coordinated AI regulation. Atomic power can generate destruction, devastate regions, and can also be used to improve citizens' welfare, for example, by producing energy. Nuclear power plants generate electricity through fission, splitting uranium atoms. The International Energy Agency («IEA») shows that nuclear power is a relevant technology, providing 10% of global generation and complementing renewable clean energy. As a negative externality, the plants produce radioactive waste that has to be handled appropriately to avoid health risks. Regulation plays an essential role in controlling safety for society to ensure that technology is adequately addressed.

In 1957, the International Atomic Energy Agency ("IAEA") was created as a global initiative within the United Nations system to deal with nuclear technology challenges. The IAEA has a dual mission, promote and control the use of nuclear technology to ensure it is not used for any military purpose. Similarly, AI has enormous advantages but also significant risks. Markets cannot autoregulate efficiently, and even being aware that regulation has costs, government intervention is needed to control and mitigate the risks associated with AI. This technology is complex and is continuously improving, and individual efforts to control the harmful effects will have limited success. Whatever the equilibrium between maximizing the efficiencies and minimizing AI's harmful effects, countries must coordinate a global initiative to ensure AI's safe, secure, and peaceful use.

References

Acemoglu, D., Restrepo, P., 2022. Tasks, Automation, and the Rise in U.S. Wage Inequality. Econometrica 90, 1973-2016.

Acharya, V.V., Baghai, R.P., Subramanian, K.V., 2013. Labor Laws and Innovation. The Journal of Law & Economics 56, 997-1037.

Aghion, P., Bergeaud, A., van Reenen, J., 2021. The Impact of Regulation on Innovation: National Bureau of Economic Research, Inc.

Alonso, C., Berg, A., Kothari, S., Papageorgiou, C., Rehman, S., 2022. Will the AI revolution cause a great divergence? Journal of Monetary Economics 127, 18-37.

Barro, R., Sala-i-Martin, X., 2003. Economic Growth, 2nd Edition: The MIT Press.

Briggs, J., Kodnani, D., 2023. Generative AI could raise global GDP by 7%: Goldman Sachs.

Diamond, R., McQuade, T., Qian, F., 2019. The Effects of Rent Control Expansion on Tenants, Landlords, and Inequality: Evidence from San Francisco. American Economic Review 109, 3365-3394.

European Parliament, 2022. The Dutch childcare benefit scandal, institutional racism and algorithms. https://www.europarl.europa.eu/doceo/document/O-9-2022-000028_EN.html.

Haenlein, M., Kaplan, A.M., 2019. A Brief History of Artificial Intelligence: On the Past, Present, and Future of Artificial Intelligence. California Management Review 61, 14 - 15.

Justo-Hanani, R., 2022. The politics of Artificial Intelligence regulation and governance reform in the European Union. Policy Sciences 55, 137-159.

Kaplan, A., Haenlein, M., 2019. Siri, Siri, in my hand: Who's the fairest in the land? On the interpretations, illustrations, and implications of artificial intelligence. Business Horizons 62, 15-25.

OECD, 2015. Hearing on Disruptive Innovation: OECD Doc. DAF/COMP/M(2015)1/ANN8/FINAL (June 16-18, 2015).

Posner, R.A., 1974. Theories of Economic Regulation. The Bell Journal of Economics and Management Science 5, 335-358.

Stigler, G.J., 1971. The Theory of Economic Regulation. The Bell Journal of Economics and Management Science 2, 3-21.

Taylor, J., Hern, A., 2023. 'Godfather of AI' Geoffrey Hinton quits Google and warns over dangers of misinformation, The Guardian. https://www.theguardian.com/technology/2023/may/02/geoffrey-hinton-godfather-of-ai-quits-google-warns-dangers-of-machine-learning.

White House Office of Science and Technology Policy, 2022. Blueprint for an AI Bill of Rights: Making Automated Systems Work for the American People. The White House.