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Minds, Machines and Markets: A Political Analysis of Technological Progress in the World Economy

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Verba volant, scripta manent

Abstract:

This dissertation explores the economic impact of technological development, focusing on Artificial Intelligence (AI). The dissertation highlights the complex relationship between society (minds), automation and AI (machines), and the digital revolution (markets) as technological development particularized by elements such as AI, algorithms, digital economy and "big data" increasingly influence society in spheres like employment, productivity, business models, trade, and macroeconomics.

This research provides a comprehensive, interdisciplinary analysis of AI's effects on employment, productivity, and economic systems, addressing gaps in existing literature and prioritizing diverse sources to avoid bias. It´s important to notice that my perspective as a writer to engage on these topics discussion is market not only as an academic researcher but as someone who had a brief but a revealing professional as intern for a sector of Portuguese Ministry of Economy encounter that focused on innovation, digital economy and technological revolution economic and political matter. This dissertation is structured on three sections to attend the theme´s imposing paradigms.

The first section examines the impact of algorithms and AI on jobs, wages, and inequality, as AI increasingly influences society, influencing employment, productivity, business models, trade, and macroeconomics.

The second section investigates the dynamics of the data-driven economy, the proliferation of data, and its implications for business practices, particularly in the context of surveillance capitalism.

The final section explores the complex interactions among technology, the state, and private corporations, focusing on AI, trade, and international macroeconomics as it

scrutinizes public policy models in China and the USA, examining their approaches to AI technology, corporations, protectionism, and the challenges to U.S. global technology leadership.

By examining these research themes, the dissertation aims to contribute to the existing body of knowledge on the political dimensions of technological advancement, offering insights into the challenges, opportunities, and policy responses in an increasingly technology-driven world.

Keywords: International Political Economy, AI, Digital Economy, Trade, Geostrategy, Data, Global Value Chain (GVC), Reshoring, New Geographies of Production.

Resumo:

Esta dissertação explora o impacto económico do desenvolvimento tecnológico, centrando-se na Inteligência Artificial (IA). A dissertação destaca a relação complexa entre a sociedade (mentes), a automação e a IA (máquinas) e a revolução digital (mercados), uma vez que o desenvolvimento tecnológico particularizado por elementos como a IA, os algoritmos, a economia digital e *"big data"* influenciam cada vez mais a sociedade em domínios como o emprego, a produtividade, os modelos de negócio, o comércio internacional e a macroeconomia.

Esta investigação fornece uma análise abrangente e interdisciplinar dos efeitos da IA no emprego, na produtividade e nos sistemas económicos, abordando lacunas na literatura existente e dando prioridade a diversas fontes para evitar preconceitos. É importante notar que a minha perspetiva como escritor para participar na discussão sobre estes tópicos é o mercado, não apenas como investigador académico, mas como alguém que teve um breve, mas revelador, encontro profissional como estagiário do Ministério da Economia português num setor que se especializava em matéria a economia digital e a revolução tecnológica. Esta dissertação está estruturada em três secções para atender aos paradigmas imponentes do tema.

A primeira secção examina o impacto dos algoritmos e da IA no emprego, nos salários e na desigualdade, à medida que a IA influencia cada vez mais a sociedade, influenciando o emprego, a produtividade, os modelos de negócio, o comércio e a macroeconomia.

A segunda secção investiga a dinâmica da economia baseada em dados, a proliferação de dados e as suas implicações para as práticas empresariais, em particular no contexto do “capitalismo de vigilância”.

A secção final explora as interações complexas entre a tecnologia, o Estado e as empresas privadas, centrando-se na IA, no comércio e na macroeconomia internacional, ao analisar os modelos de políticas públicas na China e nos EUA, examinando as suas abordagens à tecnologia da IA, às empresas, ao protecionismo e aos desafios à liderança tecnológica global dos EUA.

Ao examinar estes temas de investigação, a dissertação visa contribuir para o corpo de conhecimento existente sobre as dimensões políticas do avanço tecnológico, oferecendo uma visão dos desafios, oportunidades e respostas políticas num mundo cada vez mais tecnológico e digital.

Palavras-chave: Economia Política Internacional, IA, Economia Digital, Comércio, Geoestratégia, Dados, Cadeia Global de Valor (GVC), *Reshoring*, Novas Geografias de Produção.

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Introduction

Artificial Intelligence is rapidly transforming many industries, including manufacturing, healthcare, finance, and transportation. As AI becomes increasingly prevalent, its economic impact is being closely scrutinized by policymakers, academics, and the public. Essentially, I choose to pursue this topic to make a valuable contribution to the academic and policy discussions, supported with empirical evidence and analysis, to the debate on technological development with a particular focus on AI´s impact on the Economy. To assert why a dissertation project on the economic implications of AI would therefore be a timely and relevant contribution to understanding current economic trends and their subsequent impacts on society, and politics and why they laid the foundation towards a new economic model the following ideas must be considered from the start.

Firstly, AI is becoming increasingly pervasive in many industries, and its impact on the economy is already being felt in areas such as job displacement, productivity gains, and changes in consumer behaviour.

Secondly, AI is a complex and multidisciplinary field, and studying its economic implications requires a deep understanding of both economics and AI. Furthermore, the economic implications of AI are complex and far-reaching, requiring careful consideration and planning by policymakers, businesses, and individuals to maximize the potential benefits and mitigate potential negative impacts.

Thirdly, the economic implications of AI are a subject of ongoing debate and controversy as some argue pessimistically that AI will lead to significant job losses and economic inequality, while others believe optimistically that it will create new jobs and opportunities for economic growth.

In an era characterised by the relentless march of technological progress, our society teeters on the precipice of transformative change. The intricate interplay of these advancements across the economic, political, and societal spheres has ignited discussions that echo through our media, institutions, and daily lives. The central question at hand is not one of prediction, but rather of preparation and qualitative analysis. This dissertation aims to serve as a guiding light, shedding illumination on the multifaceted consequences of this technological surge. Its mission is not to foretell the future with unwavering certainty or policy-based recommendations but to equip stakeholders – including policymakers and the general public – with the tools necessary to engage in informed discourse, make sagacious decisions, and exert democratic influence over the pivotal choices that loom on the horizon.

To develop a more comprehensive and compelling argument, this thesis will succeed with the analysis of different lenses that sometimes provide divisive outcomes and openly corroborate or refute certain narratives on related topics as multiple perspectives arrange the argument within stronger validity and reliability of sources. As according to Martinez and Stowell *"Including diverse perspectives in the research process is essential because it can help identify biases, uncover hidden assumptions, and reveal how multiple factors are interconnected. By incorporating multiple perspectives, researchers can also more effectively interpret data and analyse complex problems, which can lead to more robust conclusions and recommendations."*[1] Within a Bibliographical range in such dividing topics from a quasi Hollywoodesque pessimism to Utopian technological optimism that regards little or no constraints, I seek to explore

[1] Martinez, M. G., & Stowell, J. R. "Incorporating Multiple Perspectives in Research: Five Recommendations." Journal of Business and Psychology 34, no. 4 (2019): 493-504.

valid arguments and different academic perspectives to assess the true impact of AI and consequently, its strengths, weaknesses, opportunities and threats.

In my pursuit to address critical gaps in existing academic literature, this thesis adopts an extensive and interdisciplinary approach. I have meticulously scoured a myriad of sources, including journal articles, books, research reports, and dissertations, covering a spectrum of topics such as **International Economics**, **Political Science**, **Public Policy**, **Macroeconomics**, **Business Management**, and **Economic Diplomacy**. Concerning the literary review to acquire to my analysis, my research will go through an investigation using mainly relevant qualitative literature (in resemblance to my dissertation) and intermittently using statistical information to complement the facts with figures.

Through this rigorous review, it became evident that the economic effects of technological development demanded a comprehensive analysis that transcended traditional disciplinary boundaries. The prevailing research landscape, though rich in diversity, often tended to fragment the subject matter, focusing on specific facets of AI's impact rather than providing a holistic overview. This fragmentation underscored the need for a more encompassing approach. Furthermore, AI's economic ramifications are inherently interdisciplinary, touching upon economics, data science, business management, political science, and philosophy, among others. To grasp the full scope of this intricate topic, an interdisciplinary perspective is indispensable. This thesis embraces this necessity and integrates insights from various academic disciplines to offer a comprehensive analysis. In addition, the existing literature frequently exhibits a tendency to lean on a limited pool of primary authors and sources, occasionally perpetuating certain biases. Many studies cite the same sources and rely heavily on reports from entities like PwC, BCG, Deloitte, which may have vested interests. This narrow approach typically

overlooks valuable contributions from academics across disciplines and geographic regions.

This dissertation aims to examine the multi-dimensional economic implications of Technological development with a particular focus on AI, including its impact on productivity, employment, and income distribution, the generated impacts towards a new business models driven by data, the proliferation and aggregated reliance on a data-driven economy, the impact of digital tech and AI on trade and the reconfiguration of value chains trade and how the quest for AI supremacy is changing international macroeconomics. These are topics in which further reflection is necessary to understand the current economic trends and *how can they influence society, the economy and geopolitics* as AI continues to penetrate every aspect of business and society. This dissertation was constructed on three chapters and fifteen subtopics in accordance with the concerning main topics of discussion:

I. CHAPTER I: From Algorithms to AI: How modern AI works and how it can be applied in order to impact Productivity and the subsequent impact on Jobs, Wages and Inequality.

How modern AI works and how it can be applied in order to impact Productivity and the subsequent impact on Jobs, Wages and Inequality?

II. CHAPTER II: The usage of digital surveillance to a new kind of commercial model

How does the economy turned data driven and data began to be capitalized by all sectors of the economy?

III. CHAPTER III: Tech, State and Utopia –Regarding AI, Trade and International Macroeconomics

How does digitalization, the new geographies of production and the quest for AI supremacy is changing international macroeconomics?

This dissertation initial section addressed the way modern AI works and its applications, specifically its impact on productivity, jobs, salaries, and inequality Our inquiry embarks on a journey through an array of scenarios, each offering a unique vantage point on the evolving landscape. From overly pessimistic narratives that stoke apprehension about a bleak future to cautiously grounded projections, informed by the wisdom of experts from diverse academic disciplines and esteemed firms, we traverse a spectrum of possibilities.

Firstly, despite the ubiquitous presence of digitalisation and technological innovation, Western economies have witnessed a concerning decline in labour productivity. This enigmatic paradox stands in contrast to reports from respected entities such as McKinsey and PwC, heralding significant productivity gains arising from the automation of tasks that were once the exclusive purview of human endeavour.

Secondly, these reports, while extolling the potential for heightened productivity, simultaneously sound a note of caution – a clarion call that raises the spectre of substantial job displacement. The question that looms is stark: could human workers become obsolete in this ever-evolving employment landscape? Our investigations lead us to the proposition that technological diffusion may be more gradual than initially foreseen, and the cost-to-benefit ratio of job substitution may present a formidable barrier. Furthermore, historical precedent suggests that technological progress often births new employment opportunities over the medium to long term. However, it is prudent to remain vigilant, particularly concerning the turbulent waters of short to medium-term disruption.

Thirdly, our exploration illuminates the critical importance of preparation for these transitional moments, particularly with regard to the livelihoods of lower-skilled workers within Western societies. As certain vocations teeter on the precipice of obsolescence – a case in point being that of the truck driver – it becomes imperative to orchestrate a comprehensive overhaul of our educational systems, adapting them to harmonise with the shifting employment terrain, as Martin Ford mentions[2]. Furthermore, the formidable challenge of addressing the resulting unemployment crisis necessitates substantial investments in upskilling and reskilling initiatives. However, the transformative tide may also swell the tide of inequality, compelling an augmented role for state intervention – possibly through the enactment of stimulus packages or the implementation of Universal Basic Income (UBI) which is supported by M. Ford and described by the popular Libertarian economist Frederich Hayek *"is a certain minimum income for everyone, or a sort of floor below which nobody need fall even when he is unable to provide for himself"*[3] .

In summation of the first section, while public discourse may, at times, be permeated by a discordant symphony of alarm bells heralding the spectre of technological disruption, particularly in the context of the burgeoning field of Artificial Intelligence, empirical evidence suggests a more measured pace of technological change. While automation undoubtedly portends a reconfiguration of the employment landscape, our analysis posits that the anticipated pace of this transformation, as Wim Naudé[4] concludes contradiction Martin Ford´s dystopian AI future, is likely to be tempered in comparison to the prevailing hype. Nevertheless, in a world where the spectre of technological

[2] See Ford, Martin. The Rise of Robots. New York: Basic Books, 2015.
[3] Hayek, Friedrich. Law, Legislation and Liberty, Volume 3, Chapter 3, Page 55. 1979. https://books.google.pt/books?id=nclLLOfnGqAC&pg=PA55 .
[4] See Naudé, Wim, and Thomas Gries. "Artificial Intelligence, Jobs, Inequality and Productivity: Does Aggregate Demand Matter?" IZA. IZA Institute of Labor Economics, November 2018. https://www.iza.org/publications/dp/12005/imprint Accessed 01 May, 2022.

feudalism, characterised by falling wages and surging unemployment, lurks in the shadows, it is imperative that we remain ever vigilant.

Data has undeniably assumed a central role in the fabric of modern capitalism, permeating all sectors of the economy. This is the guideline of the second section´s plot. Rather than treating data as a mere commodity, some contemporary thinkers view it as a dimension of capital itself. This shift in perspective sets the stage for our second section's primary objective: *to empirically highlight how digitalisation and AI are giving rise to a novel business model*. The drive behind this new business model, in which the main characteristics were loosely described in a 2014 OECD report[5], is particularly dependent on AI to leverage rapid, efficient, and superhuman-level data analysis. It is essential to recognise that "big data" has effectively become the custodian of our digital footprints, encompassing our social data, search engine activities, online purchases, and more[6]. The new business models are predicated on the relentless exploitation of this continuous DataStream, effectively capitalising on various aspects of human life with minimal constraints[7].

Across all sectors, businesses and consumers have become deeply intertwined with the dynamics of digital business models. Technology has made communication seamless, and data collection, analysis, and processing have become second nature. The digital economy has, in essence, become synonymous with the economy itself. This transformation transcends sectors such as retail, financial services, education, agriculture, transport, logistics, and manufacturing. These sectors all rely on digital

[5] OECD. 2014. "Addressing the Tax Challenges of the Digital Economy." In OECD/G20 Base Erosion and Profit Shifting Project, chapter 4, 69-99. OECD Publishing, Paris. https://doi.org/10.1787/9789264218789-en

[7] See See Couldry, Nick, and Ulisses Meijas. "THE COSTS OF CONNECTION How Data Is Colonizing Human Life and Appropriating It for Capitalism." Colonized by Data, 2021. https://colonizedbydata.com/ . April 25, 2022

advertising, e-commerce, business-to-business solutions facilitated by web-based commerce, data analysis, profiling, machinery and vehicle maintenance software, online customer support, and a plethora of other features emblematic of the digital business model. While this dissertation does not focus exclusively on the digital economy, it does touch upon topics like automation, advanced robotics in manufacturing, new data collection and storage methods, as well as big data analytics—all of which are products of AI, notably deep learning and machine learning.

As the year 2022, our world begun enduring on continuously significant challenges, including the relentless COVID-19 pandemic, financial hardships, inflation, and geopolitical tensions such as the Ukraine invasion. These adversities resulted in substantial price increases for essential commodities, outpacing wage growth and reducing citizens' purchasing power. The 2020s marked a stark contrast to the economic prosperity of the 1990s, with global protests addressing issues like climate change, corruption, racism, and economic inequality, exemplified by the Yellow Vests protests. These events reflect profound societal transformations influenced by the failures of neoliberalism, which include income inequality, outsourcing, and wealth concentration among elites. These factors have led to rising unemployment and austerity measures. Shoshana Zuboff[8], through Thomas Piketty's analyses, highlight how wealth inequality is exacerbated as the return rate of capital consistently exceeds economic growth, creating what Zuboff calls a neo-feudal state. However, Jonah Goldberg offers a contrasting perspective in his book **The Suicide of the West**.[9] While not specifically addressing technology and surveillance capitalism, Goldberg disputes the notion that elites manipulate society, emphasizing dynamic political battles among liberal and

[8] See Zuboff, Shoshana. The Age of Surveillance Capitalism: The Fight for a Human Future at the New Frontier of Power. New York: PublicAffairs, 2020
[9] See Goldberg, Jonah. “Suicide of the West.” Random House US, 2020.

conservative billionaires. He advocates a return to conservative values like limited government, natural rights, traditional values, and individual liberty to counter widespread distrust in liberal institutions.

The emergence of "third modernity" raises questions about human obsolescence, the pursuit of a meaningful life, and the role of data-driven capitalism, while Big Tech monopolies challenge free-market logic and usher in some respects in the tone of surveillance capitalism. Joseph E. Stiglitz's critique of "creative destruction[10]" highlights how persistent monopoly profits in today's markets, driven by companies like Amazon, Google, Tesla, and Microsoft, challenge the theory's assumptions. The COVID-19 pandemic accelerated digitalisation, intensifying online interactions and surveillance capitalism. As we contemplate the future, we must grapple with the implications of data-driven capitalism, the erosion of privacy, and the shifting power dynamics between citizens and tech giants, demanding unwavering attention in navigating the complexities of the digital age. Before delving into the global economy's current dependence on data, it is imperative to briefly examine the transformative effects ushered in by the digital economy. The catch phrase "Data is the new Oil" has become a ubiquitous metaphor for understanding the economic landscape of contemporary digitalisation. However, it is crucial to discern that data differs significantly from oil. Unlike oil, data is not a finite resource; instead, it is subject to temporal constraints influenced by both the predictive value of data and evolving public policies regarding privacy. This distinction forms the basis for understanding the unique dynamics at play in the data-driven era.

[10] See Stiglitz, Joseph E. "Joseph Stiglitz: Are Markets Efficient, or Do They Tend towards Monopoly? the Verdict Is In." World Economic Forum, May 18, 2016. https://www.weforum.org/agenda/2016/05/joseph-stiglitz-are-markets-efficient-or-do-they-tend-towards-monopoly-the-verdict-is-in/ . Accessed May 03, 2022

As we transition to our next section, **Tech, State, and Utopia – Regarding AI, Trade, and International Macroeconomics,** we delve deeper into the intersection of technology, governance, and economics. The role of data, advanced analytics, and AI in shaping international trade and macroeconomic policies becomes increasingly critical, offering both opportunities and challenges for the global landscape. Our exploration will shed light on the intricate web of relationships between technology, state actors, and economic paradigms, underscoring the importance of informed decision-making in an era dominated by data and algorithms.

At the heart of this inquiry lies a crucial acknowledgment of the seamless international collaboration and integration of AI technologies. AI transcends national borders, operating within a global digital ecosystem that spans diverse industries, from logistics to gig economy platforms and consumer products. Within this interconnected digital realm, it becomes evident that ensuring fairness, accountability, and security in cross-border AI operations is of paramount importance. Our investigation further unravels the pivotal role played by digital platforms in this global AI ecosystem. These platforms serve as the linchpin, enabling real-time data exchange and fostering communication across geographies. Their significance becomes even more apparent as they intertwine with the intricacies of Global Value Chains (GVCs) and Global Production Networks, facilitating real-time interfirm relations and technological transfer while enhancing firm-level capabilities.

A foundational concept that underpins our analysis is the transformation in the global manufacturing landscape, a result of the dynamic interplay between AI, digital platforms, and GVCs. This transformation aligns with the seminal insights of Ronald

Coase, dating back to his 1937 paper, **The Nature of the Firm**[11]. Coase's assertion that firms exist to reduce transaction costs and that their boundaries are determined by the balance between coordinating activities within and outside the firm takes on new relevance in this digital age. Additionally, we explore the implications of AI on the theory of comparative advantage, as initially proposed by David Ricardo[12]. In this evolving landscape, countries must recalibrate their focus towards producing goods and services where they hold a lower opportunity cost to fully harness the benefits of trade.

As we navigate this intricate terrain, it becomes evident that the global economy, fuelled by AI and digital technology, has grown more complex, interdependent, and competitive. Traditional concepts of competitive advantage are undergoing a profound transformation as AI introduces the dimension of data-driven customization and personalization at scale. This shift challenges conventional trade theories such as Comparative Advantage and Competitive Advantage, necessitating adaptation by policymakers and researchers as following the argument by Goldfarb and Trefler[13]. Geopolitically, our analysis casts a spotlight on the intense competition for AI dominance, notably between global powers like China and the United States. China's considerable investments in AI research and development, underscored by its "New Generation AI Development Plan", offer an alternative model to the market-driven approach favoured by the United States. This competition is the dawn of a new era as

[11] Coase, R. H. "The Nature of the Firm." Economica 4, no. 16 (1937): 386-405. https://doi.org/10.1111/j.1468-0335.1937.tb00002.x

[12] See Ricardo, David. The works and correspondence of David Ricardo. Edited by Maurice Dobb and Piero Sraffa. Vol. 1. 2004 of On the Principles of Political Economy and Taxation. Carmel, IN: Liberty Fund,

[13] See Goldfarb, Avi, and Daniel Trefler. "AI and International Trade." National Bureau of Economic Research Working Paper w24254, 2018. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3112041 Accessed 13th of April, 2023

noted by Larry Diamond[14], extends beyond economic dimensions and holds the potential to reshape international norms and standards in AI governance, ethics, and legislation. Moreover, we consider the demographic challenges faced by these nations and their strategic moves towards automation in response to shifting workforce dynamics, as observed in the arguments of Doshi Rush[15].

In conclusion, this final section unravels the multifaceted dynamics of the evolving international macroeconomics, driven by the forces of digitalization, changing production paradigms, and the pursuit of AI excellence. Understanding these complexities is pivotal for policymakers, businesses, and researchers as they navigate the transformative landscape of international trade and geopolitics in the digital age.

[14] See Diamond, Larry. "We Have Entered a New Historical Era": Larry Diamond on the Future of Democracy." Stanford.Edu, April 11, 2022. https://fsi.stanford.edu/news/we-have-entered-new-historic-era-larry-diamond-addresses-future-democracy . Accessed on 19th of June 2023

[15] Doshi, Rush. "The United States, China, and the Contest for the Fourth Industrial Revolution." Brookings, July 31, 2021. https://www.brookings.edu/articles/the-united-states-china-and-the-contest-for-the-fourth-industrial-revolution/ . Accessed July 11, 2023

CHAPTER I: From Algorithms to AI: How modern AI works and how it can be applied in order to impact Productivity and the subsequent impact on Jobs, Wages and Inequality

1.1) From Existence to Intelligence

"What all of us have to do is to make sure we are using AI in a way that is for the benefit of humanity, not to the detriment of humanity." - Tim Cook, CEO of Apple

One of the many ways to answer *what makes man unique?* can be found in the enormous flexibility displaced by the cerebral cortex allowing the Human to exhibit what Thomas Hobbes named "*the manipulation of mental symbols*" which allowed us to create languages to describe and communicate complex and abstract ideas. The human domain of the mental manipulation of symbols and subsequently the creation of other forms to communicate has conducted *"the creation of culture and technologies, the inherent characteristics of our species"*[16]. This Hobbesian analysis of *what makes man unique* is highly contested as it is a mechanistic theory that weighs in by postulating that human reasoning persists on "the manipulation of mental symbols" and therefore can be breakdown and expressed by the product of calculus. There were no computers or even mechanic calculators in the 17th century, particularly in 1651 when Thomas Hobbes wrote ***"The Leviathan"***, so Hobbes could not of course witness the digital and mechanical manipulation of mental symbols, however, Hobbes proclaims and underpins future assumptions of many mathematicians, digital developers and thinkers alike such as the Silicon Valley elite that the processes of human intelligence could be replaced by the products of calculus.

Although it is challenging to summarise a concise definition of intelligent behaviour, we normally associate intelligence with what allows "reasoning". Human intelligence goes beyond traits shared by other animals such as recognizing predators and

[16] Oliveira, Arlindo. Inteligência artificial. Lisboa. Fundação Francisco Manuel dos Santos. 2019: 23

other exterior threats, food sources, and other vital functions that are essential for survival. Man had created language and other forms of communication, mathematics, poetry, art, music, etc… According to Arlindo Oliveira, this was only possible with the mental manipulation of symbols alongside a set of genetic mutations that conducted humanity to the modern man which can create and communicate culture[17]. Culture allows man to propagate knowledge throughout a generational time set. The development of technology isn't the direct result of the human being's superior intelligence, but it's depended on the propagation of knowledge[18]. This idea also discloses that these cultural revolutions allow men to establish themselves in several parts of the planet and become the dominant species. Yuval Noah Harari emphasizes the latter conceptual thoughts in his book ***Sapiens: The Brief History of Humankind.*** Deep social changes were introduced with the advent of agricultural revolutions, sedentarism, writing, mathematics, the wheel, metal, steam power, electricity, the telephone, transistors, microchips, etc. These inventions revolutionized the demographical, political, economic and in sum social tissue of humanity, eventually establishing a role in our daily life in which humans have a high degree of dependency on digital information and communication technologies such as our computers and cell phones.

[17] Artificial Intelligence, Arlindo Oliveira 26
[18] See Harari, Yuval Noah. Sapiens: A Brief History of Humankind. Page 36. New York: Harper, 2015

1.2) Can machines be intelligent?

"I visualize a time when we will be to robots what dogs are to humans, and I'm rooting for the machines." —

Claude Shannon, mathematician and "father" of the Information theory

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With the introduction of computers, we have started to wonder *if the computer can ever perform in an intelligent form in similarity to the behaviour of a human being in the same situation?* The former question seems to be confused with an underlying topic that forms an anthropomorphic prejudice - Can machines think? - and a negative reply will eventually condition our answer concerning whether AI can be considered intelligent. Although it is a central dilemma regarding the ethical sense of AI, this dissertation won't supply the reader with an answer, but likewise, it will not also be biased towards the theories that support if a computer can conduct more effective outcomes and strategies than a human. The later questions of this paragraph were firstly approached by Alan Turing in his famous 1950 article "***Computing machinery and intelligence"***[19], published in the journal Mind where he concluded that computers i.e., the contemporary World War II cryptographers could perform an "imitation game" by performing the same task as a human being by manipulating symbols. The Turing test[20] established that if a machine could pass the "imitation game" and deceive a human being into thinking that it's human, then the machine could be accounted as intelligent.

As previously stated, we assume intelligence to be a uniquely human trait by comprehending it as the product of a mixed solution that involves experiences and

[19] Turing, Alan M. "Computing Machinery and Intelligence." Mind 59, no. 236 (October 1950): 433–460.
[20] See Oppy, Graham and David Dowe, "The Turing Test", The Stanford Encyclopedia of Philosophy (Winter 2021 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/win2021/entries/turing-test/>. Accessed 1st of April 2022

wisdom: it requires leaving moments with a sort of abstractive freedom of conceptualizing reality! To perceive intelligence as a necessary attribute to reach goals reduces Intelligence in a mechanistic view as from the behaviouristic or functional perspective, being skilled with intelligence requires the capability of reaching a certain outcome. However, Computers play a game of chess, communicate in a somewhat logical form of dialogue by using and interpreting language, solve algebra operations and diagnose medical problems… These are tasks that according to our criteria we assumed as "intelligent" however computers don't have a mind! It can be concluded that the dilemma that distinguishes a Behaviourist/functional view of intelligence from a non-Behaviouristic/functional view is that the latter sees intelligence as inseparable from feelings and consciousness in short what Neuroscientist António Damásio refers to as sentience[21]. The common definition perceives sentience as *"(…) a multidimensional subjective phenomenon that refers to the depth of awareness an individual possesses about himself or herself and others"*[22] and this is demystified by Behaviouristics as António Damásio as he states that a specific form of consciousness, through "homeostasis", isn´t a necessary domain to create intelligence/sapience as it is a realm of sentience. It is fair to assume that sapience and sentience are being confounded tricking people towards a static view in which Intelligence is uniquely human. Damásio concludes *"There is plenty of evidence that artificial organisms can be designed so as to operate intelligently and even surpass the intelligence of human organisms. But there is no evidence that such artificial organisms, designed for the sole purpose of being intelligent, can generate feelings just because they are behaving intelligently"*[23]

[21] See Damásio, Antonio (October 2001). "Fundamental feelings". Nature. 413 (6858): 781. Bibcode:2001Natur.413..781D. doi:10.1038/35101669

[22] In Sentience. Science Direct. Accessed October 26, 2022. https://www.sciencedirect.com/topics/neuroscience/sentience.

[23] Beres, Derek, and António Damásio. The one thing A.I. needs is the one thing we likely cannot program. Other. Big Think. Big Think - TECHNOLOGY & INNOVATION , May 4, 2018. Beres, Derek.

Melanie Mitchell, in the chapter *AI: Narrow and General, Weak and Strong*, of her book ***AI: a guide for thinking humans***[24] says that computers are a formal system that achieves results because of calculus and AI doesn't have an understanding of the concrete meaning behind the tasks. In fact, AI relies on deep learning or machine learning that use statistical studies of linear regression in order to establish a pattern from data. This pattern is then used in order to make some sort of classification or prediction. The human developers just supply the machine with the basic rules that constitutes the training set of data analysis as the machine focus on an inductive process of decision making (and therefore learning) throughout the probability theory. Now, this leads up towards a major conclusion that circles the difference in intelligence between AI and Humans: While AI´s "brain" works in a inductive way, the Human brain works mostly in a deductive way as the conclusion necessarily follows the premisses, unlike the inductive conclusion that is either strong or weak as opposed to a deductive validity.

Even nowadays General AI cannot yet reproduce an indistinguishable behaviour from humans. Some Narrow AI systems such as Deep Blue and Alpha Go can behave like a Human and actually even surpass Humans in their own game. The changes that we have been witnessing especially in the middle of the 20th century have been standardizing data processing tasks and automating much of the physical labour performed by humans. The fact is that AI has made striking advances in certain areas even in doing things that we take to be inherently human such as poetry, art, music. Robotics advancements such

https://bigthink.com/technology-innovation/is-artificial-intelligence-even-possible-without-emotions/. Accessed October 27, 2022

[24] Mitchell, Melanie. "AI: Narrow and General, Weak and Strong." In Artificial Intelligence: A Guide for Thinking Humans, New York: Farrar, Straus and Giroux, 2019

as ELIZA[25] and SOPHIA[26], which are representative of the evolution of artificial technology in the last 50 years, are undoubtedly performing a greater number of tasks and assuming a human resemblance in terms of interacting with the outer world but they cannot fully mimic general human behaviour. Although we are witnessing a rapid evolution in topics around AI such as machine/ deep learning "induction" capacities we must note that: In fact, pretty much all the areas of the human brain that are related to the perception and interaction with the world are especially hard to replicate! Tasks like recognizing a familiar face, understanding phrases in a noisy environment, or recognizing relevant objects in an image are generally easy tasks for humans even for small children but are extremely complex for an AI system that relies mostly on less complex and controlled environments. General AI truly capable of imitating a human being in all different areas is still a dream, however if we look at the trajectory of computer power and Moore´s law (as the premiss that the number of components of a computer chip doubles in two) such as AI utopians such as Kurzweil state that it's going to happen soon. Scientifically and statistically, we can be assured that is going to happen as it's a matter of time. However, looking at the current phenomena and particularly into the current Economic implications, companies are using only Narrow AI in activities such as intelligence augmentation, data and performance analysis, Image recognition, etc…

The inability of which computers are less capable of reproducing trivial behaviours for human beings and many animals is characterized by the Moravec Paradox[27] which postulates the notion that it is much easier to reproduce in a computer

[25] See Weinzenbaum, Josep. "ELIZA A Computer Program For the Study of Natural Language Communication Between Man And Machine .". https://web.stanford.edu/class/linguist238/p36-weizenabaum.pdf. Accessed March 2, 2022

[26] See Sorkin, Andrew Ross, and Sophia. Interview With The Lifelike Hot Robot Named Sophia (Full) | CNBC. Other, n.d. Interview at the 2017 Future Investment Institute panel in Saudi Arabia

[27] See Doherty, Sally. "Narrow vs General Ai - Is Moravec's Paradox Still Relevant?" Graphcore. Accessed March 8, 2022. https://www.graphcore.ai/posts/is-moravecs-paradox-still-relevant-for-ai-today.

outcome that relies on complex mathematical reasoning compared to recognising a face or understanding a spoken language. Moravec´s paradox is being overturned nowadays by more than the ancient "narrow" AI systems, but with "general" AI systems. These "general" AI systems resort to the aggregation of multiple AI tools within the developer designed purposes such as "narrow" systems such as image classification and recognition, personal assistants like Alexa and Siri aided in the natural language processing (NLP)[28] and optimization of our personal preferences via analysing of our search engines mechanisms results and preferences. Nowadays, AI-based systems can interact with the decision processes on who we date, what kind of music and videos to replay, who we vote for, if it's time to buy a new sofa, what is our next travel destination, the manufacturer of our next car, etc. In light of the pervasive influence of AI on various aspects of our lives, it becomes crucial to explore the role and significance of algorithms and data across these diverse AI applications as is fundamental to comprehending the evolving landscape of human interactions with technology.

[28] See Banerjee, Dibyendu. "Natural Language Processing (NLP) Simplified : A Step-by-Step Guide." Data Science Foundation. Accessed March 9, 2022. https://datascience.foundation/sciencewhitepaper/natural-language-processing-nlp-simplified-a-step-by-step-guide.

1.3) The meanings of Algorithms and Data for the different modalities of Artificial Intelligence

"Machine learning allows us to build software solutions that exceed human understanding and shows us how AI can innervate every industry." -

Steve Jurvetson, Board Member of SpaceX and Tesla

To understand AI, we must first understand that there are different levels of AI. AI was first developed to endure uniquely human tasks like for example the Deep blue computer that in 1997 defeated Gary Kasparov[29]. AI has been gradually developing to a point that we see "narrow" AI as in sort of superhuman scale that accomplishes tasks with performance, and efficiency and by taking a lot less time than i.e., than employee does. Narrow AI surpassed humans on many tasks such as: Image and facial recognition systems; Chatbots and conversational assistants; autonomous assistance in vehicles; Predictive maintenance models; Medical patterns, Recommendation engines; etc. The genesis of the latter AI systems is that they works by relying on algorithms specifically designed to perform that specific task and the original programmer's data to do so. Narrow/specific AI systems can also be enhanced by the process of machine learning as it can surpass the classical narrow AI[30] as is the case for the example of Alpha Go. AI developed a level of superintelligence that potentialized AI to assume a more "General" form forming a revolution of computer-based intelligence in several tasks and manners. General AI systems rely on a training process supplied by data from the outputs of users to allow the program to gather a certain amount of information to establish patterns that

[29] See Kasparov, Garry. Deep Thinking: Where Machine Intelligence Ends and Human Creativity Begins. London: Hodder & Stoughton, 2017

[30] Alpha go is a Narrow AI (programmed just for one task) but enhances its capacities by using machine learning and not by just having humans writing all the code

enable the process of computer profiling the data. After the instance in which the machine starts profiling inputs into data, the machine learning process starts writing its own codes allowing it to get better at the task it was designed to perform or even by performing even more tasks.

Symbolic/Classic AI programs are cemented in the developer´s structure and in behaviour rules. Symbols are the way we represent "things". If we want to define and describe "this" such as an element in the periodic table, a chair, an event, etc. as well as abstract concepts such as a musical composition and elements that don´t physically exist such as the *World Wide Web* (*WWW).* Symbols allow us to express our sentiments, to think and communicate… "To be intelligent!" Symbolic AI is a ruled based program and it still constitutes the underpinnings of the majority of AI programs even those used to create tools such as Deep learning and Machine learning. Symbolic AI can be best illustrated by the common example situation of image recognition captchas that bind us to recognize a certain element present in some displayed images in order to access a certain functionality and or web site. Internauts train the machines for futural recognition/ association of that particular shape (a symbol) portrayed by a set of pixels amounting to the representation of a sidewalk, cat, dog, bus, etc. Purely Symbolic AI is limited as when in the same above-mentioned situation, an image change occurs within a single pixel then it´s not capable of recognizing the same shape even if it has a slightly different camera angle. Without the inductive inference of Deep Learning Symbolic AI would be pointless i.e. for image recognition. As Leslie Valiant mentions Symbolic AI has become "Neuro-Symbolic" as it was introduced by a sort of cognitive reasoning with machine learning

models to symbolic reasoning. This is what we would refer to as the current "*triumvirate of a Hybrid Infrastructure*"[31].

While Melanie Mitchell looks at the AI dilemma centred on the spectre of ***General versus Narrow AI***[32] (specific/limited task), Hannah Fry will look at the AI dilemma in a way in which the main predicament is centred on the ***Symbolic versus Artificial Neural Networks***[33] ways that AI operate. It's also fundamental to understand what is an algorithm in order to perceive in what ways it may influence us. So, to put it shortly: an algorithm is a finite logical sequence of rules or instructions that tells the computer to perform a task. But then the main dilemma of AI is that it will revolve around these two main strategies to approach how algorithms are written and data is approached.

The symbolic AI alone, without the above-mentioned influence of a Hybrid Infrastructure, constitutes a limitation because humans write the algorithms and that imposes the limits on machines based on their learning experience as well as the fact that the program might be doomed to human error. Classic Symbolic AI is a top-down approach where you first see the task and it will require the use of several players to play the task and convert the inputs of several players to the next and then it becomes algorithms. This was in a way what deep blue has done by playing with several chess players and then defeating the world champion of chess. However, the mere Symbolic AI is as authors, such as Hal Varian[34] and Gary Marcus[35] stated, is in its downfall as the current sphere of relevant AI systems is Neuro-Symbolic.

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[31] See Valiant, Leslie G. "Knowledge Infusion: In Pursuit of Robustness in Artificial Intelligence." In Foundations of Software Technology and Theoretical Computer Science (Bangalore), edited by R. Hariharan, M. Mukund, and V. Vinay. 2008: 415-422.
[32] See Mitchell, "AI: Narrow and General, Weak and Strong."
[33] See Fry, Hannah. "Data." Essay In Hello World: Being Human in the Age of Algorithms New York: W.W. Norton & Company, 2018
[34] See Varian, Hal. "Artificial Intelligence, Economics, and Industrial Organization." In The Economics of Artificial Intelligence: An Agenda, edited by Ajay Agrawal, Joshua Gans, and Avi Goldfarb, University of Chicago Press, May 2019. http://www.nber.org/chapters/c14017. Accessed March 03, 2021
[35] See Marcus, Gary. "The Next Decade in AI: Four Steps Towards Robust Artificial Intelligence." Robust AI, 17 February 2020. Cornell University. https://doi.org/10.48550/arXiv.2002.06177

The artificial neural networks will teach themselves and get more powerful by writing their own algorithms towards things we humans are not as effective as. These sorts of mechanisms can be seen operating when you use i.e., Google search via the way the sites are presented and the suggested results, in the matches that you get from dating apps, in the suggestions of Facebook friends, in the ads that you see online, etc. No one fully understands how this artificial neural network operates because understanding the mathematics that allows the system to rewrite models to enhance its performance on the tasks, are subjects that are part of our daily life and we must understand that the machine learning paradigm urgently requires our understanding for political and moral reasons: after all, why did we get used to trusting things whose workings we don´t understand?

It´s crucial to consider the element of the Neuro-Symbolic approach is an effort to combine elements of the Symbolic AI approach and Artificial Neural Networks towards learning and logic. David Cox, former professor at Harvard and current director of the MIT-IBM Watson A.I. Lab in Cambridge, MA., complements this idea as he states that it´s wrong to perceive that both modalities (used to write algorithms) are at odds with each other as the goal of neuro-symbolic AI[36]. is to integrate these methodologies in order to combine learning with logic[37]. Instead of depending on human programmers to reduce the world down into symbols, neural networks will help make symbolic A.I. systems smarter. Meanwhile, symbolic A.I. techniques will let deep learning combine common sense reasoning and domain expertise. The findings might lead to major advancements in A.I. systems that tackle hard tasks ranging from self-driving automobiles to natural language processing. All while requiring far less data for training. A final question to

[36] See "David Cox Director of MIT-IBM Watson AI Lab: The Future of AI, Quantum Computers and XR #c2Montreal." YouTube, February 12, 2020. https://www.youtube.com/watch?v=Hq0OPv6e9KA. Accessed May 05, 2022

[37]See Dormehl, Luke. "Why Neuro-Symbolic Artificial Intelligence Is the A.I. of the Future." Digital Trends. Digital Trends, January 5, 2020. https://www.digitaltrends.com/cool-tech/neuro-symbolic-ai-the-future/. Accessed October 27, 2022

understand about these key elements that we need to consider about AI, as we need to understand a primary concept of data. Now, how do we generate Data? We generate data for example when we use the apps on our phone, when we search and register online, when we shop at the mall and give our contact information like email address and phone number, etc. By enrolling in such as our personal activities, our preferences will be translated into a digital file that will represent your individual preferences on us by thousands and thousands of details on several categories and these will also not only collect but will cross the references and the AI will analyse our data. Data allows "Modern AI" to operate on the premises of machine learning algorithms that are probabilistic, unlike classical learning algorithms that operate in a deterministic manner, we must consider their consequences in the spheres of ethical, political and social implications.

A recent threat involving Data was the Cambridge Analytica[38] scandal which made us exposed to the dangers of technological manipulation and question why we may think we are immune to psychological manipulation when we use technology in ways, we don't expect it rationally (tailored ways). Algorithms can make assumptions about our identity, demographics and what is going through in our lives just five looking at what we buy, the things we search for on the Internet, our friends on social media, our ZIP Codes, where we went go school, and many other things that are part of our identity. The use of algorithms and other tools derived from AI is growing across all sectors due to the fact that the industrial development of AI is being driven by either the provider of services and technologies, which typically are large tech companies such as the case of IBM with Watson or in other hand companies that specialize the collective data strategies and trading data. The latter companies offer AI tools as a primary feature of their services

[38] See "The Facebook Scandal Could Change Politics as Well as the Internet." The Economist. The Economist Newspaper. Accessed March 14, 2022. https://www.economist.com/united-states/2018/03/22/the-facebook-scandal-could-change-politics-as-well-as-the-internet.

such as Google's case with translation, image recognition or speech recognition software. There are of course several commonplaces where we may find the use of algorithms across all sectors of society, such as:

- Online search engines results and recommendations.
- Advertising or political “targeting” in campaigns.
- The recommendation on what social networks should we use.
- What product should be in our online shopping cart?
- Our next music, video, series and/or movie that we’re going to stream (on platforms such as YouTube, Netflix and Spotify).
- What routes are we going to take and where it's going to be our next destination (such as the recommendation of restaurants, touristic sites and those spots that are “trending”)?
- It is also being increasingly revolutionizing our healthcare systems as the use of algorithms is promoting health surveillance. We’ve seen this with the technological instruments used to mitigate the Covid-19 pandemic as well as with strategies to track down and diminish mental health risks and other therapeutic solutions which are encompassed by linking the data of patients within large-scale datasets.
- AI is also retuning the judicial strategy as algorithms and data enable tools to process case law data to assist the concerning legal occupations parties involved by producing recommendations for the outcome of the trial or what judicial strategies to use.
- Algorithms also assist in the process of developing strategies for personalizing education via the tracking of progress, placement and preferences of school pupils.

- Algorithms are also a crucial part of their recruitment for jobs as there currently are available software solutions that match the preferred requirements for each job vacancy with the applicant´s qualifications and for other corporate usages such as for managing their human resources.
- Security-wise it is also important to notice that AI and algorithms are in use to prevent future crimes, assist the investigations, profile suspects and predict advent within a counterterrorism spectre and map the areas that need further law enforcement support.

It is important to mention that even though there are several different usages of algorithms and AI across all industrial sectors and on the infrastructures of our social, political and economic realities, we must understand that AI tools typically work on a "narrower" basis using specific domain competencies developed by extracting patterns and making predictions from large datasets. It's crucial to comprehend the latter to understand that AI is profoundly dependent on data and in particular in its *veracity and velocity*[39] not only to originate good predictions but also to put "learning" in the process of machine learning. As Rodney Brooks emphasizes: *"machine learning is very brittle, and it requires lots of preparation by human researchers or engineers, special-purpose coding, special-purpose sets of training data, and a custom learning structure for each new problem domain"*[40]. The need for data for the investment in AI and machine learning discloses probably the major economic change of the 21st century: the world´s economic system has become primarily data-driven! The latter is explicitly evident when we realize than an estimated 50% of the equity trading on the stock market is done by algorithms &

[39] See Naudé, Wim. "The Race against the Robots and the Fallacy of the Giant Cheesecake: Immediate and Imagined Impacts of Artificial Intelligence." WWW.IZA.ORG. Maastricht University, UNU-MERIT, MSM, RWTH Aachen University and IZA, March 2019. https://docs.iza.org/dp12218.pdf.
[40] Brooks, Rodney. 2017. "The Seven Deadly Sins of AI Predictions." MIT Technology Review, October 6. Accessed October 28, 2022.

AI[41] programs such as Marcus by Goldman Sachs[42] that allows users to automate their investments and assist in managing their financial portfolio. The increment role of AI and machine learning in economic decisions makes explicit that data is a valuable (intangible) resource - so the bigger the dataset the greater is the advantage and influence of a firm - and this may explain the claim of The Economist magazine that ***"the world's most valuable resource is no longer oil, but data"***[43].

Transitioning from the significance of data in the AI landscape, we delve into the avenues through which Artificial Intelligence is enhanced, which is the focus of the upcoming section. Understanding the pivotal role of data in AI, as discussed earlier, lays the foundation for comprehending how AI evolves and thrives within the three distinct channels of production, a topic explored in the subsequent section. These channels delineate the diverse mechanisms through which AI technologies are developed, trained, and harnessed across industries, all of which are underpinned by the indispensable role of data in shaping the landscape of the 21st-century data-driven economy.

[41] See Byrnes, Nanette. "As Goldman Embraces Automation, Even the Masters of the Universe Are Threatened." MIT Technology Review. MIT Technology Review, February 7, 2017. https://www.technologyreview.com/2017/02/07/154141/as-goldman-embraces-automation-even-the-masters-of-the-universe-are-threatened/. Accessed 27, October 2022

[42] See "Marcus by Goldman Sachs®." Personal Loans, High-Yield Savings & CDs. https://www.marcus.com/us/en. Accessed October 27, 2022

[43] "The World's Most Valuable Resource Is No Longer Oil, but Data." The Economist. Accessed July 26, 2023. https://www.economist.com/leaders/2017/05/06/the-worlds-most-valuable-resource-is-no-longer-oil-but-data. Accessed May 15, 2022

1.4) The three channels of production for AI enhancement

"First of all, we are nowhere close to knowing how to build a general AI — something that could set its own objectives," - Jeff Bezos

Essentially, there are three broad channels in which the unleashing of AI´s economic potential is being used to cut down costs and increase growth:

I. AI is often used as a complementary way to enhance productivity.

Acemoglu and Restrepo called this first channel of production "augmentation"[44] due to the fact that AI is used in this channel of production as a means to augment labour and capital while lower inputs are deployed. Augmentative AI doesn't replace the needs for human labour but works on aiding by improving the resulting tasks as a 2019 FORBES article put it "*subtle interplay between human and machine agency*"[45]. Intelligence Augmentation (IA) is a method that employs technology to increase corporate value while not replacing human workers in their activities. Augmented intelligence technologies are primarily associated with processes of collecting various types of data using machine learning and deep learning algorithms to assist workers in their jobs, allowing them to be more productive, faster, and spend less time on more mundane and time-consuming tasks such as data analysis (in which AI can analyse large datasets in short amounts of time), which eventually results in a prediction. This involves a combination of both AI and human intelligence. Augmented intelligence shows its efficiency in combining the superhuman ability to analyse data, detecting complex patterns far too complex for quick

[44] See Acemoglu, Daron, and Pascual Restrepo. "Artificial Intelligence, Automation and Work." NBER, January 15, 2018. https://www.nber.org/papers/w24196. Accessed May 2, 2022

[45] Cagle, Kurt. "Ai Augmentation: The Real Future of Artificial Intelligence." Forbes. Forbes Magazine, October 1, 2019. https://www.forbes.com/sites/cognitiveworld/2019/09/30/ai-augmentation-the-real-future-of-artificial-intelligence/?sh=7a69b481393e. Accessed May 2, 2022

human analysis in a superhuman time and scale to analyse data, and this efficiency is shown by e.g., by the number of cases where AI outperforms for example oncologists whether if a patient's tumour is benign or malign within by the process of image analysis or hearth disease variations analysing such things as vocal patterns. Augmented intelligence solutions are also cheaper, easier to deploy and develop and quicker to adopt compared to AI-driven for human labour substitution so it's not disruptive to the current business model as a trade-off between human expertise and technology as it adds volume to productivity in the different stages while it's quicker to integrate into the workplace and relies on multiple AI tools supplemented by R&D´s machine learning algorithms and extensive combining data sets. Intelligence augmentation may intensify the demand for jobs as it is redefining many existing occupations and creating new ones[46] due to the benefits of augmenting human capabilities resulting in output growth. Augmentative intelligence works on a "narrower AI" basis and can be used in applications such as when political think tanks/ online stores use data analytics to understand who is their public targets and preferences, online customer assistance chat boxes, popular virtual assistants like Siri or Alexa, preventing Industrial machinery maintenance according with technical reports (this is another potentially profitable use of AI tools for productivity and the business model), autopilot systems for airplanes and cars, etc. A 2017 MGI study suggested, *"that, on average, 60 percent of occupations have at least 30 percent of activities that theoretically could be automated by adapting and integrating technologies that exist today—numbers that clearly vary from occupation to occupation"*[47].

[46]See "Artificial Intelligence Will Create New Kinds of Work." The Economist, August 26, 2017. https://www.economist.com/business/2017/08/26/artificial-intelligence-will-create-new-kinds-of-work. Accessed May 05, 2022

[47]See Manyika, James, Michael Chui, Mehdi Miremadi, Jacques Bughin, Katy George, Paul Willmott, and Martin Dewhurst. "Harnessing Automation for a Future That Works." McKinsey Company, January 12, 2017. https://www.mckinsey.com/featured-insights/digital-disruption/harnessing-automation-for-a-future-that-works. Accessed May 6, 2022

Intelligence Augmentation frees up and cuts down workers to engage in higher-value tasks.

II. Contrary to the first channel of production (augmentation), the second channel of production is a substitution process.

Substitution relies on the automation of the production process and there so human labour tasks are fully automated by new technologies. The substitution of the channels of the production process relies on the assumption that AI and robots can eventually outperform humans in many tasks while not only being more productive (contributing to labour productivity growth) but also with fewer economic costs. Substitution is an advertised belief grounded in the modern *sine qua non* of AI: it's in the capability of doing things that human beings cannot reasonably aspire to. The real driver for automation and the development of AI technologies in the business model is the relative costs of machines and wages. By the second half of the 20th century, companies began the outsourcing process which was primarily driven by lower labour costs with higher availability along with establishing manufacturing plants closer to the sources of raw material, resulting in fewer logistical costs and lower capital inputs. Outsourcing was primarily done in developing countries such as countries in the Eastern Europe (like Poland and Ukraine) and South Asian countries (I.e., India and the Philippines). Studying the reasons behind outsourcing and the subsequent shift of manufacturing plants, labour needs and capital flows not only explains well why the Western "blue-collar workers" are the primary losers with the advent of hyper globalisation and why western´s labour productivity growth rate is declining, but it also comprehends an important lesson in what may happen in a near future to western blue-collar workers due to the potential automation risk. The fact is that there is a lower potential to automate in less-developed countries because costs relative to wages are lower compared to higher wages paid in the West although in parallel with

the advent of the Covid-19 pandemic crisis we may find that there are also efforts from big firms to reduce their dependence on extensive global supply chains and there so relocate them at home again[48]. This is another topic that "substitution" arises and it's also a topic for the next chapters of this Dissertation in order to comprehend how technology is going to impact our life within the scope of the future scenarios, strengths and limitations of AI. But for now, we will stick with practical examples with the advent of driverless cars and fully automated car manufacturing plants alongside some present and future projections of "substitution" concerning Technology and Labour Demand.

Consider the following area of AI as an example of cutting down labour costs and increasing productivity: self-driving cars. We currently can opt-out for a car with level IV autonomous driving in which humans may still override a system of high-level driving automation that mostly doesn´t require human interaction. Levels of driving automation go all the way from 0 to 5, where 0 means no automation and where the driver performs all driving tasks and five represents a fully automated system where the vehicle performs all driving tasks under all situations, and it's speculated that they won't even have a steering wheel and pedals. As of 2022 level IV autonomy is still a recent topic and it has been an object of dialogue between legislators primarily due to ethical concerns that are epitomized in questions such as who is responsible in case of a crash? The driver? The manufacturer? The programmer? Legislators, particularly in the United States of America and Europe, have agreed that autonomous cars should operate in scenarios with imposed lower speed limits, but this legislative delay hasn't stopped companies like Alphabet's subsidiary Waymo[49]from offering level for taxi services in Arizona without a

[48] See Kilic, Kemal, and Dalia Marin. "How Covid-19 Is Transforming the World Economy." VOX, CEPR Policy Portal. Centre for Economic Policy Research. 2020. https://voxeu.org/article/how-covid-19-transforming-world-economy. Accessed March 28, 2022

[49]See Sage, Alexandria. "Waymo Unveils Self-Driving Taxi Service in Arizona for Paying Customers." Reuters. Thomson Reuters, December 5, 2018. https://www.reuters.com/article/us-waymo-selfdriving-

driver on the seat. Similarly, in China, Volvo and Baidu announced a public partnership to launch "Robotaxi" in different marketplaces with stage IV and V autonomous electric vehicles. Fully autonomous cars eliminate the needs of the human elements - as a driver - and that eliminates labour costs. It also draws out of the equation human error and habits as the driverless car conducts us via the quickest route while producing less Co2 emissions and representing a lower risk of having an accident. The same principles of economic and environmental sustainability apply to the trucking business, where it is planned that soon autonomous trucks will take over the roads and safety and efficiency for the logistics process[50]. Morgan Stanley estimates that the potential economic impacts of autonomous vehicles could be up to $1.5 trillion dollars by the year 2040[51];

An additional example of how AI, automation and robots could help by cutting down labour costs and increasing productivity is by having fully autonomous robots in manufacturing plants. Automotive manufacturing is probably one of the best examples to perceive the evolution of automating plants throughout the 20th and 21st centuries. Coincidently it becomes a great example to perspective it future costs and outcomes of industrial autonomous robots. To perform a future prediction of how robots going to impact the production and business model is necessary to comprehend first that this decision will be made around calculus drawn out by firms that will account for how costly by again maintaining these autonomous machines will be and labour costs. A Boston consulting company 2015 report considers that on average a US welder at an automotive manufacturing plant that costs the firm around $25 per hour could be replaced by a robot

focus/waymo-unveils-self-driving-taxi-service-in-arizona-for-paying-customers-idUSKBN1O41M2. Accessed March 28, 2022

[50] See Alonso Raposo, María, Monica Grosso, Andromachi Mourtzouchou, Jette Krause, Amandine Duboz, and Biagio Ciuffo. "Economic Implications of a Connected and Automated Mobility in Europe." Research in Transportation Economics 92 (2022): 101072. ISSN 0739-8859. https://doi.org/10.1016/j.retrec.2021.101072. Accessed October 27, 2022

[51] See Adam Jonas, "Are Flying Cars Preparing for Takeoff?" Morgan Stanley. https://www.morganstanley.com/ideas/autonomous-aircraft. Accessed March 29, 2022

which has an e of $8 per hour including depreciation, installation and maintenance. By 2030 as well as other aggregated costs. According to Boston Consulting Group (BCG), the operating costs of the robot could halve by twice to $2 per hour[52]. These reductions in production costs will also cause prices to fall and a subsequent rise in demand. The latter chiefly means that society is going to be richer with AI automation, so society will demand more on everything and the demand for tasks that we currently proceed within the near future cannot be automated will also rise exponentially on their demand. Contrary to the optimist view, the pessimistic prediction is that automation would lead to mass unemployment, lower wages and lower demand. In future topics, we will address and equilibrium impact regarding the analysis of pessimistic and optimistic predictions while taking a stance on present empirical information. "Substitution" also pre-sets leverage on competition within the market share as having a leading position on the technological readiness for AI gives them an advantage towards the new business models. The effects of this technological race may be deceptive towards the future of substitution and the reports of the big firms and other corporate surveys may be skewed toward "early movers". Another topic necessary to comprehend these analyses is that the drop-off input costs are what truly commands the intensity of substitution, but if we look at the recent examples in companies like Amazon[53] and Tesla[54], we may find that currently, they prefer the "human in the loop" strategy because right now it's the more efficient and cheaper alternative. So, the important conclusion we can draw is that the intensity of substitution

[52] See Sirkin, H., Zinser, M. and Rose, J. "Featured Insights and Perspectives from BCG." BCG Global. https://www.bcgperspectives.com/content/articles/lean-manufacturing-innovation-robots-redefinecompetitiveness. Accessed March 29, 2022

[53] See Rosenbaum, Eric. "Why Amazon Warehouses and Tesla Auto Plants Will Not Go 100% Robot Any Time Soon." CNBC. CNBC, September 23, 2020. https://www.cnbc.com/2020/09/16/why-amazon-warehouses-tesla-auto-plants-will-not-go-100percent-robot.html . Accessed March 29, 2022.

[54] See Gibbs, Samuel. "Elon Musk Drafts in Humans after Robots Slow down Tesla Model 3 Production." The Guardian. Guardian News and Media, April 16, 2018. https://www.theguardian.com/technology/2018/apr/16/elon-musk-humans-robots-slow-down-tesla-model-3-production. Accessed March 29, 2022

is going to rely on the future technological progress towards the technological and production efficiency of the industrial machines and robots as well as the adhesion to these technologies and new business models which eventually generates an interconnected relationship with the operating costs of these machines.

III. The third channel of production for assuring the firm-level impact of AI goes beyond the 1st channel of production (augmentation) and 2nd channel of production (substitution), as it isn't a direct way to change drastically the business model or to improve productivity. I propose we can name it "Advanced Integration Channel" as it goes beyond the above mentioned processes.

This 3rd channel of production is shaped by the opportunities supplied by the variety of AI tools that can help companies innovate their products while expanding their sales and the offerings of their products and services. AI is remarkably efficient in the way it processes data so, for business purposes, it's quick and efficient for identifying and ruling out hypotheses as well as surpassing obstacles like uncertainty or lack of information while conducting business decisions for stronger and more focused solutions. The various usages in which AI can help businesses by the means of data processing are significant and with no doubt empirically proved in tasks like cross-referencing data, detecting frauds, customer targeting via the analysis of data of consumer preferences and personalized advertising, online chat boxes or the natural language processing via telephone that in the past decade revolutionized consumer experience in the after-sales department, etc. AI revolutionized the way that we interact and process data especially in the services sector (which is the biggest element of the economy in developed countries), especially in areas like banking and finance. For product development it can also shorten substantially what would previously take years in the several processes of planning,

developing and testing by within months due to the technologies such as the augmented and virtual reality that shorten the process as well as the ways AI draws different scenarios based on the data inputs, deep learning and machine learning processes.

AI can also supply personalized consumer experience by prefiling the customer individually as well as analysing the trends of demographics and drawing econometric models of consumers' cycles and spotting what products are trending (while making such products trading by advertising). AI not only helps businesses gain market share, to reach different markets and to create niche markets but it's also the motor for businesses to test new ideas and different concepts[55] and effectively tell if there is a market failure situation, demand for that particular product and the demographic for the target audience. A fine example of how AI is being used for targeting customers and product development is OTTO, a large German e-commerce retailer. The key to success is its fully automated procurement system that´s driven by a deep learning algorithm that develops predictive models, enabling OTTO to have stocks ready to ship when whether demand is higher or lower, with the analyses of more than 200 variables such as style, brand, colour, size, etc. This e-commerce giant is using a highly sophisticated algorithm that based on big data predicts and understands consumer tastes while trying to lower the returns of products that represent fairly high costs yearly[56]. OTTO`s algorithm was a breakthrough revolution in how consumer preferences are predicted and since then major firms like Amazon (the most powerful e-commerce firm in the world) have been using algorithms with similar means and strategies. Otto is a tool for marketing the right product, at the right time to

[55] See Columbus, Louis. "10 Ways Ai Is Improving New Product Development." Forbes. Forbes Magazine, July 9, 2020. https://www.forbes.com/sites/louiscolumbus/2020/07/09/10-ways-ai-is-improving-new-product-development/?sh=64039d245d3c.
[56] See "How Germany's Otto Uses Artificial Intelligence." The Economist. The Economist Newspaper, April 12, 2017. https://www.economist.com/business/2017/04/12/how-germanys-otto-uses-artificial-intelligence.

the right people as it uses AI to expand sales by securing more efficient offerings of products and services.

In conclusion, the three channels of production for AI enhancement represent distinct approaches to harnessing the economic potential of AI. These three channels demonstrate the multifaceted nature of AI's economic impact, offering businesses a range of strategies to enhance productivity, reduce costs, and drive innovation. As AI permeates virtually every facet of industry and commerce, the profound implications of these channels underscore their significance in shaping the future of business, highlighting the imperative for organizations to embrace AI-driven approaches to remain competitive and agile.

1.5) Impact on productivity and Output

> *"Firms will address the pragmatic side of AI now that they have a better understanding of the challenges and embrace the idea that 'no pain means no AI gain.' The AI reality is here. Firms are starting to recognize what it is and isn't…and they are seeing the real challenges of AI versus what they assumed the challenges would be."*
>
> *— Michele Goetz, Principal Analyst, Forrester*

Considering the overview that I previously performed on how AI works and the many ways it may influence us in our lives, we can now reflect on ensuring the economic impact of AI in the ways that will impact jobs, businesses, the consumer experience, trade and economic development in general. The basis of the development of AI tools for economic purposes relies on the premises on which the economy is empirically based such as the rational choice theory[57]: *maximizing the benefits to cost ratio*. With the advent of AI, firms can conduct their business more efficiently while at lower costs by applying AI to the equation of jobs and productivity to get a more efficient result. So, what are the major drivers for AI's economic impact? Well, we can first assume that there are four main dimensions in which AI could impact the global GDP:

- **Labour productivity**

- **Personalization of services**

- **Time saved**

- **Quality of goods and services**

[57] See Lockert, Melanie. "Rational Choice Theory: A School of Thought That Predicts Economic and Social Behaviors." Business Insider. Business Insider, December 1, 2021. https://www.businessinsider.com/rational-choice-theory. Accessed May 15, 2022

These previous four variables, accordingly to the considerations of big audit firms like PwC, McKinsey, Accenture, etc. seem to be hereafter subject to greater economic gains, extensively contributing to the discussion in which some authors and reports predict that "***The Fourth economic revolution"*** (or the digital revolution) is going to be as disruptive as the advent of electricity. It's also important to mention that we cannot dismiss that there are also contrary opinions that perceive the future relation between AI and subsequential "*speed of impact*" of automation to be less representative of a "substantial economic growth" as authors such as Phillipe Aghion advert that "*with inappropriate institutions, and in particular with inappropriate competition policy, AI may slow down economic growth*"[58]. However, the Governmental reports and developed frameworks (such as in the case of the EU), as well as the "big and reputable" firms' economic modelling estimates of AI's potential value, seem to represent results that vary widely, but they all have in common figures that amount a situation in which *"economic growth will accelerate sharply as an ever-increasing pace of improvements cascade through the economy"*[59].

How can we portray AI and recent Technological developments in Global economic growth? This question is the *raison d´être* of this Dissertation, however it is important to note that this dissertation focuses on re-evaluating these forecasts, which are based on the examination of microeconomic data, and is not intended to be a full-fledged prognostic exercise. I achieve my analysis trough an investigation of multiple distinct viewpoints from writers from various scientific backgrounds, which provide divisive

[58] Aghion, Philippe, Antonin, Céline and Bunel, Simon. "On the Effects of Artificial Intelligence on Growth and Employment." In Work in the Age of Data. Madrid: BBVA, 2019. https://www.bbvaopenmind.com/en/articles/on-the-effects-of-artificial-intelligence-on-growth-and-employment/.

[59] Nordhaus, William. Are We Approaching an Economic Singularity? Information Technology and the Future of Economic Growth. Cowles Foundation Discussion Paper no. 2021. Yale University, 2015: 02

outcomes ranging from a quasi Hollywoodesque pessimism to Utopian technological optimism that sees little or no constraints. Although in a future chapter of this dissertation I will address the possible outcomes for the future of economic growth, jobs and inequality, it becomes urgent to analyse the empirical findings in a more unbiased way as humanly possible. To provide a theoretical explanation of how AI can impact the economic system it becomes crucial to search for an answer on How can we assess AI's impact on productivity and output?

To judge how AI is going to affect labour productivity in the near future, we first must proceed to comprehend what is the current environment between the relationship between labour productivity growth and economic development. But first: how can we define "labour productivity"? The formula to understanding the basis in order to proceed to articulate the impact and definitive definition of the latter is that labour productivity is measured by the relation of the *GDP per hour worked*. Labour productivity growth is a critical component of economic success and a fundamental driver of changes in living standards. The increase in GDP per capita may be divided into two categories[60][61]:

a) growth in labour productivity (measured as GDP per hour worked)

b) changes in the amount of labour utilisation (measured as hours worked per capita).

There has been a long decline in labour productivity growth in regions such as the United States of America and Western Europe that started back in the 1970s. Whereas in the USA, labour productivity growth between the 1950s and 60s was respectably 2.3%

[60] OECD. Labour productivity and utilisation (indicator). 2022. doi:10.1787/02c02f63-en Accessed on 14 December 2022

[61] OECD Factbook - Oecd-Ilibrary.org.2013 https://www.oecd-ilibrary.org/docserver/factbook-2013en.pdf?expires=1616271490&id=id&accname=guest&checksum=9B457B4C4A9116F15E901BEBA349666F. Accessed March 21, 2022

and 2.5%, which was followed by the 1970s with 1.03%, the 1980s with 1.8% and the 90s with 2.5%. The empirical evidence of Labour productivity growth in the USA shows us that it experienced a downfall after the 60s and reached a new high at 2,5% in the 1990s but after that it proceeded to plummet to historically low rates which figure around to 1.3% from 2005 to 2015. The decline of labour productivity growth also takes place across the OECD countries that on average suffered a decline from 2.3% in the period comprehended between 1995- 2004 to 1.1% between 2005 and 2015. In Western European countries such as Germany and the United Kingdom, the decline in labour productivity growth was even more evident translated into figures that are below and around the 0.5% percentile on average per year since 2010[62]. The downturn of the sluggish economic growth in highly developed Western countries seems paradoxical to the recent and rapid advances in CITs and the equally rapid proliferation of AI-based tools. This can be described as the **Productivity Paradox** and as Erik Brynjolfsson, Daniel Rock, and Chad Syverson have noted, "***we see transformative new technologies everywhere but in the productivity statistics***."[63]

A **PwC 2017** report estimates that 55% of the global GDP impact between 2017 and 2030 will occur due to productivity gains[64]. These gains in GDP will subsequently be driven by the business automating processes and the augmentation of labour forces with AI technologies (which will be assisted, autonomous or with augmented intelligence) and overall strength for future productivity gains. In parallel, with

[62] See Naudé, Wim, and Thomas Gries. "Artificial Intelligence, Jobs, Inequality and Productivity: Does Aggregate Demand Matter?" IZA. Accessed March 21, 2022. https://www.iza.org/publications/dp/12005/artificial-intelligence-jobs-inequality-and-productivity-does-aggregate-demand-matter.

[63] Agrawal, Ajay. "The Economics of Artificial Intelligence: An Agenda: Hardcover." Barnes & Noble. University of Chicago Press, May 22, 2019. https://www.barnesandnoble.com/w/the-economics-of-artificial-intelligence-ajay-k-agrawal/1129474082.

[64] See PwC, "Sizing the Prize: What's the Real Value of AI for Your Business and How Can You Capitalize?" (2017). https://www.pwc.com/gx/en/issues/analytics/assets/pwc-ai-analysis-sizing-the-prize-report.pdf. Accessed March 21, 2022,

productivity gains, there will also be a revolution in the consumer experience and demand due to the general improvements by having a personalized supply and the improvements in the quality of the products and services of AI of methods products (which should also bring prices down). Regarding the necessity of trying to comprehend a feasible answer to why the productivity growth has been so disappointing even with rapid technological advances in automation? We must consider that there are a lot of different answers which eventually point out different reasons for different outcomes. However, because of the future and present relation between AI and the economy, we have to consider:

a) In what ways can apply AI-driven factors in terms of productivity growth, innovation, labour automation and competitiveness?

b) How can AI help companies not only to make things more efficient (by increasing productivity and innovation) but also how can they enhance consumer products and services? A topic to be developed in the next chapter "digital surveillance" is used for developing a new kind of business model.

For the production side variable, there are many applications where he can currently see (and in which we can certainly expect to see a heavier presence of AI) across the value chain, however as the big firms reports outline there are **three major strategies** for applying these technologies:

- The first main strategy works by maintaining the *"human in the loop"* interference while investing in ways to augment or assist throughout the use of machinery, systems and software that allows human labourers to ever more efficiently perform throughout their past by assisting and

stimulating them in order to allow them to pursue in higher value-adding activities; ;

- The second strategy is also being accomplished by having a type of interference with *"no human in the loop"* where there is a technological effort throughout the automating processes between AI and robotics to replace humans with autonomous machines;
- The third strategy of intervention is the *"human on the loop"* in which AI systems make decisions and take actions but a human may intervene and override the decision if they disagree with the potential consequences of the action based on the AI system. This strategy assures that human may override the outcome of AI´s decision making process and intervene with supplementary accountability and safety.[6566]

The present and future impact derived from adopting AI in the business model depends of course on micro factors, that rely on the rate of adoption of AI as the main study object, and macro factors that zoom in on perceiving economic growth in long-term and a more direct analysis on business cycles. Both micro and macro analysis have to be comprehended as a whole because the size of AI's economic impact has to be measured on a micro axis which can be represented in a question such as:

a) What the AI represents for a firm in terms of productivity and production and how does it affect the presence and future business model?

[65] However, note that this isn´t a fairy-tale solution as humans cannot oversee everything that happens in the whole systems and when time sensitive decisions are required it will close the gap for human intervention.

[66] Leins, Kobi.,; Kaspersen, Andrea. (2021, November 10). 7 myths of using the term "human on the loop": "Just what do you think you are doing, Dave?". Carnegie Council for Ethics in International Affairs. https://www.carnegiecouncil.org/media/article/7-myths-of-using-the-term-human-on-the-loop Artificial Intelligence & Equality Initiative. Accessed December 14, 2022

b) In parallel, how AI is going to impact questions such as economic growth, unemployment, and business cycles?
c) Which countries and which sectors are going to emerge as dominant players and other factors that can be used to evaluate and predict the performance of economies as a whole (as opposed to the micro factors that focus on individuals and firms)?

So, it becomes necessary to understand the microeconomic sphere with our analytic lenses reflecting on what the implementation of AI means to the changes in the channels of production and in the company's business model?

1.6) Impact on Inequality, Jobs and wages

"AI's potential to reflect both the best and the worst of humanity. For example, we have seen AI providing conversation and comfort to the lonely; we have also seen AI engaging in racial discrimination. Yet the biggest harm that AI is likely to do to individuals in the short term is job displacement, as the amount of work we can automate with AI is vastly bigger than before. As leaders, it is incumbent on all of us to make sure we are building a world in which every individual has an opportunity to thrive." -

Andrew Ng, Co-founder, and lead of Google Brain.

In 2016, Martin Ford wrote his book ***"Race against the machine or the rise of robots"*** and it was another example of a sound warning that the human race was competing against automation technologies in a "race against robots". The book claims that this "race" with robots will be translated into greater inequality and significant job losses. Brynjolfsson and McAfee submitted a 2015 paper titled ***"Will humans go the way of horses?***"[67]. This paper also reflects the obsession with whether AI and automation will endure mass unemployment. The latter preoccupations are also shared by national and governmental level agencies as well as international identities such as the World Bank, the International Labour Association, World Trade Organization, World Bank, the European Union, United Nations, etc it's important to stress that there is a present anxiety in academics, governments and international agencies and organizations about accessing the exponential growth of "*substitution*". As previously stated, to enclose a strategy of "substitution" will depend on the cost to benefit relation which ideally represents low

[67] See Brynjolfsson, Erik, and Andrew McAfee. "Will Humans Go the Way of Horses? Labor in the Second Machine Age." Foreign Affairs 94. 2015: 8-14.

operation costs (replacing human labour estimated to be significantly costlier) and a higher output of productivity. It's also important to mention that one of the previous conclusions relative to this dissertation´s previous topic of discussion, is that currently "substitution" lacks technological development (despite of its rapid advances that surely will contradict me in a few years), and it also lacks the further mass adherence and proliferation of "substitution" AI and automation technologies throughout.

Recent research predicted that up to 47%[68] of jobs in the United States of America and 54%[69] in the European Union could be automated in the next 10 to 20 years. The latter theoretical explanations and reports from the big firm disclose that "substitution" of the existent jobs is unavoidable where the rapid increase of AI allows it to develop a form of super intelligence that surpasses human brainpower, and where aspects like the Moravec paradox would be overturned and humans would go "obsolete". This concern is being increasingly expressed by employees due to the awareness that AI is a powerful phenomenon in which firms have been increasing their activities on research and development to allow technological development to further their capitalization of opportunities. The rapid advances in AI and automation, nowadays used in a form of augmentation for labour tasks may in the future translate to mass "substitution" and this of course represents a greater threat to the future of the labour markets (primarily with the nonspecialized labourers), may deepen Inequality and have negative spillover effect towards income. Over time, we have empirically established that the relation between technology and economy involves the parallel processes of job creation (as demand for new types of products/ services and sectors arises) and job destruction (where certain

[68] See Frey, C. and Osborne, M. (2017). The Future of Employment: How Susceptible are Jobs to Computerization? Technological Forecasting and Social Change, 114:254{280
[69] See Bowles, Jeremy. "The Computerisation of European Jobs." Bruegel, 2017. https://www.bruegel.org/2014/07/the-computerisation-of-european-jobs/.

kinds of sectors, products and services became obsolete as well as an advent of technological replacement of jobs).

It´s difficult to predict the future with accuracy. In fact, all we can do is speculate, given the present research, trends and data. There are several approaches to figuring and estimating the impact from the implication of AI for businesses, consumers and laborers but we can say that a consensus cannot be drawn due to the variety of researchers opinions running from technological pessimism to technological optimism[70]. From the outset to throughout those forecasts present us with figures that are supplemented by different factors in different data sources and account for the same factors in different ways. If we for example compare the Digital Economy Outlook 2017 from OECD, which states that 32% of jobs will change significantly while 14% of jobs are in the risk of automation, this presents us with a very different set of outcomes from a PricewaterhouseCooper's or McKinsey Global Institute or BSC report. Reports from governments and international organizations elaborate that AI impact will have a slower diffusion there and limited impact on creating unemployment while boosting productivity and product innovations while contributing to a growth of demand and creating new jobs. Reports from the big firms tend to focus on the added gains to product innovation, productivity, demand, etc. while encouraging early movers to bet on technological tools from Automation to AI with the latter added benefits while having low operational costs, encouraging the process of substitution. Further there seems to be a consensus that AI, and particularly computer automation, will have a significant impact on shifting the nature and tasks of human labour, and it will also to significant changes across all economic sectors, as well as

[70]See Szczepański, Marcin. "Economic Impacts of Artificial Intelligence - European Parliament." Europarl.eu, 2019. https://www.europarl.europa.eu/RegData/etudes/BRIE/2019/637967/EPRS_BRI(2019)637967_EN.pdf. Accessed May 20, 2022.

wages. This underlines the cornerstone of forecasting AI's future impacts on Inequality, jobs and wages: *The reskilling paradigm*.

Authors like Korinek and Stiglitz (2017), Ray Kurzweil and Philip Aghion et al (2017)[71], share a concerning view of singularity where there is a point that it becomes cost-effective to replace totally human labour for machines. These dynamics of "substitution" underlies a situation that is outlined by the fluctuation of capital (***K***) as it grows in proportion to effective labour (***H*** (humans)+ ***M*** (Machines))[72]. Economists like Joseph E. Stiglitz, Pascoal Restrepo (MIT), Doren Acemoglu (MIT), Anthony Korinek and Eric Brynjolfsson are of course well aware of the *"lump-of-labour fallacy"* which assures that there is no such thing as a fixed number of jobs. The "lump of labour fallacy "also associates the idea that additional income (that's normally propelled by technological development) can drive the market to increase the demand for labour". So, what really propels well-established researchers to be fearful by forecasting that in the near future, the very same generated market mechanisms that we have grown accustomed to (such as the classical invisible hand) will conduct us to a situation where we are going to face in a short-medium term a disruptive transitioning situation based on three major remarks:

- Where typical labour demanded tasks will become obsolete (not necessarily jobs)[73] implying that these workers (primarily low skill workers) will need to acquire new skills, upskill or jobs to match their

[71]See Aghion, Philippe, Benjamin F. Jones, and Charles I. Jones. "Artificial Intelligence and Economic Growth." NBER Working Paper No. 23928, October 2017. https://doi.org/10.3386/w23928.
[72]See Korinek , Anton, and Joseph E. Stiglitz. "Artificial Intelligence and Its Implications for Income Distribution and Unemployment ." Columbia.edu. The University of Chicago Press, Ltd., London, 2019. https://doi.org/10.7208/ chicago/9780226613475.001.0001.
[73] See Acemoglu, D. and Restrepo, Pascual. Robots and Jobs: Evidence from US Labor Markets.NBER Working Paper no. 23285. National Bureau for Economic Research

abilities. Technological/Automation-fuelled unemployment is concern as transitioning phenomenon.

- Technological changes will be felt differently across all sectors of the economy leading to a new economical pattern where employment and output to the GDP will become more preeminent in some of nowadays less distinguishable sectors.
- This transitional moment of disruption will not be significant implying major job losses and job creation will prevail long terms of time.[74]

"Technological unemployment" is a concept that began to be observed by John Maynard Keynes in 1932[75] and it corresponds to a traditional phenomenon in which the "equilibrium" level of the workers and employees is separated by technological progress its progress results temporarily in both job destruction and job creation. The Centrepiece of this process is that capital ***(K)*** is used to substitute labour ***(L)*** in order to augment the efficiency of productivity ***(P)***. This can be explained by the fact that markets are imperfect and often generate negative externalities while enduring a slower pace at structural transformation then if they were exploring accordingly to the immediate adoption of new technologies that aggregate added efficiency. Mokyr et al (2015) noted that these processes of technological change already happened in the first and second industrial revolutions and that although some workers were displaced by automation it proportionally demanded that other kinds of jobs were created while in parallel stating that Luddites revolt against automation was in reality plotted as a scapegoat for low wages and poor work practices. Wages and standards of living exponentially climbed as a

[74] See Acemoglu, D. and Janeway, W., 2020. The Future of Work | Meaningful Integration or Jobless Future?. [online] Institute for New Economic Thinking. Available at: <https://www.ineteconomics.org/events/the-future-of-work-meaningful-integration-or-jobless-future> Accessed 7 April 2022.

[75] "this means unemployment due to our discovery of means of economising the use of labour outrunning the pace at which we can find new uses for labour" (Keynes, 1933)

consequence of the industrial revolution, but Mokyr et al (2015) also denounces that the price to pay was a very painful transition where *'by many estimates it took longer than an average working lifetime to do so, and in the long run, we are all dead'*[76].

Hypothetically this can lead to catastrophic short and medium-term and employment losses such as the case of United States the truck driving market in which the autonomous cars and trucks would put circa 8.7 million jobs at stake as Nicholas Yan exemplifies[77]. Indeed, the hypothetical scenario of widespread replacement driven by AI technology has real-world ramifications that might have a significant influence on a variety of industries and employment types. As automated checkout systems grow more sophisticated and common, it may lead to the removal of human cashiers in supermarkets. This move may possibly displacing hundreds of thousands of retail jobs. Consider the situation of ride-sharing businesses such as Uber and Lyft. The introduction of self-driving cars might mean the end of human drivers for these platforms, causing considerable job displacement in the gig economy, where many people rely on driving to make a living. This change may result in a significant number of drivers seeking alternative work or facing unemployment. These workers would be displaced for their jobs and eventually will have to accept a lower paying job and or remain unemployed. After all, reskilling and upskilling supply us with attributes that are related to our educational progress. Reskilling and upskilling in essence require a completely new educational programming.

Martin Ford in his books ***The rise of robots*** (2015) and ***The rule of robots*** (2021) states that automation will cause wages to go down and unemployment to rise severely

[76] Mokyr, J., C. Vickers and N. Ziebarth 2015), 'The History of Technological Anxietyand the Future of Economic Growth: Is this Time Different?', Journal of Economic Perspectives, Vol. 29, No. 3, 31-50
[77] See Nicholas Yan, "Automated Inequality ," Nicholas Yan (Harvard Bussiness Review, 2017), https://nicolasyan.com/writing/2016/10/02/automated-inequality. Accessed: 08 April 2022

dissipating the middle-class, who will be displaced from their jobs and eventually join lower skilled jobs and poorly paid jobs, tuning them the lower class or driving middle-class individuals to become part of upper classes, if they somehow can find opportunities to create wealth and climb the social ladder. Either way, Martin Ford states that the future of the middle class will only dictate greater inequality in a system of "technological feudalism" that is fuelled by constant growth in which a "tiny and prosperous elite"[78] that will further polarize the job market, if the lack of government interference allows this trend to take place. Ford understands that a significant part of the workforce will not succeed with the skills necessary to overcome the gap perpetuated by automation AI so he perceives that government intervention will be necessary to overcome these future structural transformations within the labour markets and the eventual disruptive Inequality. He realizes that the forecasted disruption from technological progress will need government action to combat market failures beyond the traditional Keynesian models[79] in which policymakers will have to address unemployment and Inequality with the benefits of the aggregated games in production. Such is the case of the Universal Basic Income, which is supported by M. Ford and described by the popular Libertarian economist Frederich Hayek "*is a certain minimum income for everyone, or a sort of floor below which nobody need fall even when he is unable to provide for himself*"[80]. Ford sees the US issued stimulus check of 1200USD for all American taxpayers proving that the US Congress has "*a new openness to unconventional policy responses*"[81] and this also means that the Congress is likely to have a less static reaction when the impact of AI and

[78] Ford, Martin. The Rise of Robots. New York: Basic Books, 2015.
[79] See Keynes, John Maynard. 1932. "Economic Possibilities for our Grandchildren (1930)." In Essays in Persuasion. New York: Harcourt Brace., 358– 73
[80] Hayek, Friedrich. 1979. LL, Vol. 3, Ch. 3, p. 55.
[81] Ford, Martin. Rule of the Robots: How Artificial Intelligence Will Transform Everything. New York, NY: Basic Books, 2021.

automation speeds up as there were multiple calls that appealed this stimulus to be paid monthly during lockdown´s severe months of economic closure.

Martin Ford concludes in his 2021 book ***Rule of robots*** that we are likely to face one of "*TWO AI futures*". According to Ford, the future outcome will be determined by several factors, including the advancement of AI technologies, the rate of automation adoption, social and policy responses, and the capacity to modify education and training systems to prepare workers for a changing labour market. He says that the decisions we make as a society will affect the course we take, highlighting the need for proactive efforts to achieve a happy end for everybody. However, Ford outlines two axis that will possibly equate for the future of society concerning AI:

- Technological Unemployment: According to this future scenario, the fast development of AI and automation technologies will escalate machines to become more capable of doing a wide range of activities and act as a substitute for Human Labour. The latter outcome indicates future widespread unemployment and economic inequality.
- Human-Machine Symbiosis: Rather than completely replacing jobs, AI and automation systems augment human talents, increasing productivity and efficiency across several disciplines. Humans focus on activities requiring creativity, critical thinking, emotional intelligence, and social interaction in this scenario, while AI systems perform repetitive and routine jobs. This partnership between humans and robots has the potential to boost productivity, economic growth, and quality of life.

What Ford outlines as the "*Two Future AI Futures*", in a way encapsulates what may likely be hyped from optimistic, neutral and dystopian projections of AI and human

existence. The latter is somehow contradicted by Wim Naudé's claims as he denounces that there is a "false alarmism" regarding AI due to empirical evidence that demonstrate that the pace of technological evidence is declining and why AI and automation future driven job losses will unlikely materialize[82]. To conclude the discussion regarding the future projections on inequality, jobs and wages, it´s fundamental that the decision makers to say that in order to maintain the social order and to save human existence towards property and disengagement. Public Policy must steer us away from a future where a small elite anchors power while the poor are enslaved by the technological universe in style the of The Matrix movies. However, this will eventually transform in to larger and more complicated dynamics such as: Will it become necessary for the government to provide some form of support (such as UBI)?; Are we the path to a centrally planned economy where major economic decisions are made by the government?; How far do we model state centralization as the decision of different elites starts to outweigh the decision of "We" the people?. As uncertainty wanders, time will likely contribute to governments concentrating their power and when power becomes highly concentrated, the decision-making process may be less inclusive and participatory[83].

[82] See Naudé, Wim, and Thomas Gries. "Artificial Intelligence, Jobs, Inequality and Productivity: Does Aggregate Demand Matter?" IZA Discussion Paper No. 12005, November 2018.
[83] See Dahl, Robert A. Who Governs?: Democracy and Power in an American City. Yale University Press, 1961

1.7) Retrospection and Progressive Analysis I

This dissertation initial section addressed the way modern AI works and its applications, specifically its impact on productivity, jobs, salaries, and inequality. It was clear that AI has the potential to have a big influence in many domains, with both positive and adverse effects. While AI can boost productivity and production, significantly impacting productivity and output. As it´s difficult to predict the future with accuracy, in facto all we can do is speculate, given the present research, trends and data. However, it seems to stand a widespread consensus that AI, particularly computer automation, will have a large influence on changing the nature and tasks of human labour, as well as significant changes across all economic sectors and wages. According to recent studies, up to 47% of employment in the United States and 54% in the European Union might be automated in the next 10 to 20 years. The latter theoretical explanations and reports from the large firm reveal that "substitution" of yet to be determined part of existing jobs is unavoidable but we must be aware of the "lump-of-labour fallacy" which assures that there is no such thing as a fixed number of jobs. Public Policy must mediate and prepare the future to endure in harmony and prevent disruption. Lately, policymakers need to attain to continuously be aware and interfere on a number of factors including the advancement of AI technologies, the rate of automation adoption, different social and policy responses, and the capacity to modify education and training systems to prepare workers for a changing labour market. Policies must prioritize a proactive role on response to technological impact on inequality, job displacement, and income distribution, by avoiding "Technological feudalism" and the likely effects short and medium term and employment losses. Granting that there is likely a false alarmism regarding technological disruption in particular regard of AI technologies and that

empirical evidence might suggest that the pace of technological development is declining, automation and augmentation will significantly impact the nature and tasks of human jobs but likely in a slower diffusion rate than what the hype suggest. Even so, nations must contemplate the dangers of Technological feudalism (where wages are down and unemployment is up) to maintain social order whilst allowing human existence to steer away from property and disengagement.

CHAPTER II: The usage of digital surveillance to a new kind of commercial model

2.1) Overture to a data-driven economy

"Data is a precious thing and will last longer than the systems themselves." –

Tim Berners-Lee, Co-inventor of the World Wide Web

Data has become a central feature of the modern capitalist system as it can be understood as one of the best descriptions to explain how the contemporary capitalist markets work in comparison to the added value within the processes of data circulation, data analysis and storage. Capitalism in particular has become data- driven. Jathan Sadowski explains that the collection of capital data *"is driven by the perpetual cycle of capital accumulation, which in turn drives capital to construct and rely upon a universe in which everything is made of data. The imperative to capture all data, from all sources, by any means possible influences many key decisions about business models, political governance, and technological development"*[84]. Sadowski also mentions that he perceives *data as the dimension of a form of capital***,** unlike the traditional academic literature that treats data as a commodity. To understand better the dynamics of digital capitalism, rather than perceive data as a resource used to add value (commodity), we should frame data as a form of capital due to the many ways that data can drive value and how it can pay normative importance such as in the case of data extraction. Digitalization introduced practical changes to trade by not only increasing 'the scale, scope and speed of trade' by using new technologies to expand and further explore global markets. Digitalization further enhanced the reliance on technological development that facilitated transnational communication (the key element for trade and any form of negotiation) and

[84] Sadowski, Jathan. "When Data Is Capital: Datafication, Accumulation, and Extraction ." Journals.sagepub.com. Big Data & Society, December 2019. https://journals.sagepub.com/doi/10.1177/2053951718820549. Accessed April 25, 2022

"by wire" payments, allowing to research market trends and help develop new market strategies on known and unknown territories, it also allowed rapid access and storage of data such in case of the cloud services, etc. As Susan West[85] points out the current paradigm of data capitalism in perspective is the change between a model of "print capitalism" throughout the 19th and 20th centuries towards the emergency of e-commerce in the 1990s, as the *World Wide Web* (WWW) took a further centralized rule as means to gather information and obtain knowledge, allowed progressively to study and influence the behaviours of mass audiences. As previously stated in the first chapter of this dissertation it's important to point out that the main contribution of AI toward new business models relies on the fast, efficient and continuous (as in a superhuman level) analysis of data. This chapter's main objective is to point out accordingly with empirical evidence how digitalization and AI are originating a new business model and to figure out what are the strategies behind this "New business model". The future discussion is going to be steered towards these topics but for now, the concluding remark that "big data" practically captures and appropriates all of our online footprint such as the case of our social data, search engine results and preferences, what we buy online, etc. The new business models rely indeed on the exploitation of a continuous DataStream that practically capitalizes on human life with very little or no limits[86]. It's important to introduce a preliminary idea that exacerbates the key role of data towards the commercial models and how it consolidates the power that big firms have such as Amazon, Alphabet, Tesla, etc. This idea needs to be pinpointed before I proceed to address the many aspects

[85]See West, Sarah Myers. "Data Capitalism: Redefining the Logics of Surveillance and Privacy." Business & Society 58, no. 1 (January 2019): 20–41. https://doi.org/10.1177/0007650317718185. April 25, 2022

[86]See Couldry, Nick, and Ulisses Meijas. "THE COSTS OF CONNECTION How Data Is Colonizing Human Life and Appropriating It for Capitalism." Colonized by Data, 2021.

of the “new business model” and also questions in a more direct regard particularly on how data together with machine learning or deep learning is impacting our lives.

2.2) The digital economy, new business models and key features

"The current generation of entrepreneurs is unlike any other. Empowered by digital technologies and unencumbered by legacy structures, they are unleashing fundamentally new business practices at a pace that was almost unthinkable just a couple of decades ago… inventing new business models and monetization strategies all along the way"-

Ericsson Digital Disruption Report

ICT´s completely transformed the way we express ourselves, and do business and in general it completely changed the way we interact with institutions, businesses, people and in reality, the whole outer world. ICTs have been the motor for businesses to enhance their productivity while sparing their operating costs and reaching new markets. The performance of technology, especially since the 1990s, was subject to major developments while new products and services were being developed at progressively lower costs and reaching a greater number off consumers and firms. Digitalization, particularly due to the fact that Internet is practically accessible by everyone, has been rapidly and profoundly changing the traditional business models in which industries such as retail, advertising, entertainment and news (such as case of online newspapers) were the first ones to adapt their business models towards exploring the potential of digital technology and began selling goods and services that were traditionally physical or demanded buyers to acquire them in a particular place to be traded and or consumed online. Businesses across all sectors and consumers are practically totally embedded within the dynamics off the digital business models which rely on how easy and efficient technology allows us to communicate and in an easy manner it is to collect, analyse and process data. Alongside the liberation of trade policies, the rapid advances off digitalization also brought us more diversified global value chains that rely heavily on

technologies such as ICT´s and advanced computer software to research and develop solutions to reach new markets while taking advantage of the specificities of local markets while simultaneal separating this process from productions processes such as product development and product assembly. The digital economy has become the economy itself accordingly it is important to recognize the totalizing shift across all sectors of the economy such as retail, financial services, education, agriculture, transport and logistics and manufacturing. All of the current economic sectors depend on digital advertising, e-commerce, business to business solutions (where a business sells products and services to other businesses typically propelled by web-based commerce), data analysis and profiling, software to maintain the efficiency and maintenance of machinery and vehicles, online customer support, and many other common features that represent the influence of the digital business model.

Although the realm of this dissertation isn't directed towards the digital economy itself topics such as automation and advanced robotics in manufacturing plants, the new sources of collecting and storing data as well as big data analytics are products of AI and in particular supplemented by deep learning and machine learning activities. So before searching for the current global market´s economy reliance on data it's crucial to perform a quick view on how can we characterize the changes introduced by the digital economy[87].

Industrial robots are becoming increasingly more common in augmenting and substituting humans in production plants as AI through machine learning allows them to become more autonomous in a wide variety of tasks. These robots are also becoming cheaper and increasingly capable of adapting to a wider variety of production requirements and manufacturing such as factors of timing, accuracy, payloads and even

[87]OECD. "Addressing the Tax Challenges of the Digital Economy." In OECD/G20 Base Erosion and Profit Shifting Project, 2014, 69-99.

production volume. Such is the case of drones, autonomous vehicles, Google glasses, 3D printing and mapping and accessible robotic arms producing China that assure affordability to even small manufacturers.

Mobility is a necessary definition to understand the sustainability of the digital economy and new business models. It relies on the mobility of intangibles since technology like software and AI tools are embedded in a multilayer digital activity such as in the case of software meant to be used towards research and development activities and managing production plants and logistics. Guaranteeing the mobility of intangible assets among the different applications in the value chain is crucial to secure growth and value creation. Digital economy also relies on the mobility of users since its commercial activities are without borders and consumers are subject to the same mobility paradigm sees the location of users may vary as is the case with online services and applications where hypothetically the buyer may be from a *country X*, buy the application in *country Y* and use that product in *countries W and Z.* So, elements such as extensive virtual networking, servers, broadband connectivity and data flow are a sine qua non for today's economy**.** The way that ICTs developed, and lowered costs aggregated to the technology acquisition and usage also contributed to the mobility of business functions where complex business activities can be managed over long distances, contributing to practically raising the geographical factor between a central location, the place where operations are carried out, suppliers and customers geographics.

The digital economy also relies on the product of network effects as the decisions of individuals that choose to use or not use a particular product with different types of intensity and with different approaches may impact on the benefits that other users receive when interacting with that particular technology. In other words, it's a bit like joining a social network: if you are alone, you can't really draw benefits but when other users join

the same network it generates greater user welfare. Users find marginal utility in the adherence of more individuals to the same network. There are also negative externalities such as when you increase the number of users from a determined network you may find problems like congestion which decreases the value of that particular network for the affected parties with no compensation. These network effects generated a critical mass of buyers (which tend to perceive their choices as informed via their ability to tailor their search towards the idea of the right product) and sellers that basically allows business models to become closer with the end users as it generates value by monetizing their attention[88] via advertising and data prospection on multilayer digital channels leverage to sell goods and services.

The digital economy also originated **multisided business *models*** as they rely on bringing together multiple distinct but interdependent customer groups by addressing them and attracting them simultaneously using the same interactions. This relies beforehand on the network effects that aggregates value by reaching a greater number of groups by designing products and services that connects customers with different interests to be served. Multisided markets are business to consumer (B2C) strategies designed to serve as a platform where both buyers and sellers participate in the same platform to generate value but not in the sense of a traditional store that sells for example shoes (this is a one-sided market). The multisided business model represents systems like payment card systems, eBay, the gaming industry, dating clubs, etc. What these sorts of businesses have in common is that they bring more value to either the firm or the end-user if a greater number of consumers are using those products or services[89]. Consider this scenario: when

[88] See (OECD 2014, 72)

[89] See Silverthorne, Sean, and Andrei Andrei Hagiu. New Research Explores Multi-Sided Markets. Other. Business Research for Business Leaders RESEARCH & IDEAS, March 12, 2006. https://hbswk.hbs.edu/item/new-research-explores-multi-sided-markets.

a growing number of consumers opt for online payment systems or credit cards, merchants can enjoy reduced banking fees for processing payments through these platforms. Moreover, as more merchants embrace these payment methods, it creates a mutually beneficial situation. Customers find added convenience in being able to make online or card payments at a wider range of businesses. This symbiotic relationship enhances the overall value proposition. However, there are instances where technology takes a less favourable turn. Take, for example, the prevalence of intrusive advertising through repetitive banners and pop-ups. While these approaches help subsidize sectors like the media industry, which offers services such as free streaming of music, videos, pictures, newspapers, and magazines, they can be viewed as disruptive and less user-friendly. by displaying advertisements to their user and collecting revenue not only by simply displaying and in situations when their click on adverts but by selling the collected information (via tools such like the well-known for web users cookies) to the interest parties. Multisided business models rely on the flexibility and reach displayed by the digital economy networking effects that rely on trading data to third parties that basically subsidizes the offered package to the end-user.

The new economic models of the digital economy have a tend to promote monopolistic and oligopolistic interests as in some markets some companies that emerge as a first or one of the first players that rise towards a dominant market position in a short time by leveraging on conditions such as the easiness, cost efficiency and proliferation of means of access to become more attractive to a greater amount of users. In parallel this is enhanced by network effects that ensure that multiple digital markets are influenced within a greater scale on what we call “big tech” (the assumption that the

digital and technological markets are oligopolistic)[90]. An example of how the digital paradigm can conduct towards a "the winner takes all" outcome can be found exemplified in Google's overwhelming market share, innovations and impacts on the different stages throughout many digital and World Wide Web processes: Google gained a dominant position as a search engine due to their attractive business model and innovative research and development that guaranteed technological development which captured the preference of consumers guaranteeing that rivals search engines such as Internet Explorer, Safari and Firefox to share a below than 30% market share combined[91].

The digital economy is rooted in a market characterized by its *volatility due to low entry barriers and rapidly evolving tech*[92]. This ensures that the new digital business models procure to maintain a dominant position in an environment of constant innovation and development in order to guarantee sustainability and progressively offer greater valuable proposals pinned on the efficiency of the business model and more powerful technology to leverage and maintain dominance in a climate of *fast-paced innovation* where many new ideas and actors emerge (although they tend to be subject to monopolistic/oligopolistic pressures).

The final characteristic that I would like to point out about the digital economy and the new business models is the **reliance of this new kind of commercial model on data by exploring current trends of technological configurations**, we can deduct that they greatly rely on data not only contributes towards technological development but allow

[90] See Petit, Nicolas. "The 'Moligopoly' Hypothesis." Oxford Scholarship Online. Oxford University Press, November 2020. https://oxford.universitypressscholarship.com/view/10.1093/oso/9780198837701.001.0001/oso-9780198837701-chapter-3. Accessed May 28, 2022

[91] See Bott, Jürgen, and Udo MIlkau. "The Development of Digital Business Platforms as a Challenge for Regulation." https://ec.europa.eu . European Commission, January 17, 2019. https://ec.europa.eu/competition/information/digitisation_2018/contributions/udo_milkau_juergen_bott.pdf.

[92] (OECD 2014, 84).

technology to work in a purpose manner and even guarantee cost efficiency in the whole digital economy world.

Data, alongside AI tools, is used an analytical tool to profile the many citizens of the world in order to efficiency and innovation for commercial purposes. The trading of information has become a central core towards the practice of new business models and assured that firms that early recognized the many advantages of trading, analysing and prospection of information (DATA) have become dominant actors while they had exponentially capitalized the added value of data, which allowed them to conduct an almost stratospheric economic growth. Data, AI and the digital economy are some of the necessary topics to comprehend the changes introduced by Revolution 4.0 which has been enduring a continuous process of generating a "new kind of commercial model" fuelled by intrusive schemes of collecting, cross-referencing and analysing ***"big data"***[93]. Because AI tools are assuming more preeminent roles in greater number of tasks with added autonomy and importance, it's necessary for us to understand why does data has assumed such a critical role within the rise of digital economy, becoming a sine qua non condition to rapid growth, efficiency and innovation.

In conclusion, the digital economy has not only revolutionized traditional business models but has also redefined the fundamental nature of commerce and interaction in our modern world. As we transition to our next topic, "Data is King: Proliferation and Aggregated Reliance," it becomes evident that data is the linchpin of this transformation. From its role in driving innovation to shaping consumer experiences, data stands as the

[93] BIG DATA
NOUN : Mass Noun
Computing
Extremely large data sets that may be analysed computationally to reveal patterns, trends, and associations, especially relating to human behaviour and interactions.
"Big Data". 2022. Lexico. Oxford University. https://www.lexico.com/definition/big_data. Accessed May 28, 2022

cornerstone of the digital economy's success. Our exploration of this topic will provide deeper insights into the crucial role data plays in the evolving dynamics of our contemporary economy.

2.3) ~~Cash~~ Data is King: Proliferation and Aggregated Reliance of Data-Driven Economy

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"In Today's era of volatility, there is no other way but to re-invent. the only sustainable advantage you can have over others is agility, that's it. Because nothing else is sustainable, everything else you create, somebody else will replicate."-

Jeff Bezos, Amazon Founder

Data has become the critical centrefold for modern-day capitalism as it increasingly began to be capitalized by all sectors of the economy. It's not that data suddenly getting value for economic purposes as a matter of fact: when banks in the 18th century borrowed money to merchants, farmers and industrials they would often consult land and property registration of the potential borrower (by then government collected these registry via censuses and notary institutions) as a form of ensuring if the borrower could not pay off the mortgage/loan, then the bank could assure the payment by retaining ownership of the borrower's land registry. To figure out why data exploded towards becoming a relevant economic unit, from a past of being a simple by-product of other processes and concern of scientists to having across all sectors of industries develop a reliance on data, it is crucial to demystify three important facts that propelled for the accumulation, analysis and cross-referencing of Data towards the contemporary new models of doing business and governance.

To begin with, according to a *2016 MIT technological review custom in partnership with Oracle*[94], companies choose purposely to dispose of data instead of

[94]See MIT TECHNOLOGY REVIEW CUSTOM, and ORACLE. "The Rise of Data Capital." MIT TECHNOLOGY REVIEW CUSTOM. MIT TECHNOLOGY REVIEW CUSTOM in partnership with Oracle, 2016. http://files.technologyreview.com/whitepapers/MIT_Oracle+Report-The_Rise_of_Data_Capital.pdf?_ga=2.245944258.718616379.1651142554-913851550.1651142554.

collecting it because they perceive the reference costs of data storage to not be economically viable and according to the expected aggregated benefits of data. Companies failed to see data as an asset, as they were throwing away pearls of wisdom that contained the fuel for machine learning and deep learning, in the case of AI-based tools which incur on data analysis, as well as a broader set necessity for the marketplace of improvements on the level of productivity and efficiency in addition to the "goldmine" of predictive analytics. *"With data capital, if you know something about your customer or production process, it might be something that yields value over the years,"*[95] pronounces Brynjolfsson as he stated that data, regarded as the product of digital exhaust, is literally just as other forms of capital like buildings and equipment because it's equally necessary to research and development, production and marketing and sales processes. In this report, the professor of Finance Andrew W. Lo also concludes that the perceptions that attribute value to data vary widely from industry to industry for instance: giants like Amazon, Uber and eBay as these retail giants have understood at a early point the value of data and the capabilities of data-driven decisions for profitability and output but, as professor Lo notes at the timeframe of 2016, many Fortune 500 CEO´s failed to recognize the true economic value of Data. As mentioned previously in this dissertation, data has become regarded within the scope of being an *intangible asset* as it is an asset to which you can´t directly attribute value and it´s neither physical as it depends on your input to generate value according to your strategic goals and analytical tools.

Subsequently, to generate value from data, companies used to struggle with the costs generated with collecting and storing data but by general advances on technologies such as cloud computing, allows that information can be stored and collected from

[95] MIT TECHNOLOGY REVIEW CUSTOM, and ORACLE. "The Rise of Data Capital."

online data storage centres (what we commonly call clouds), companies could now afford to collect and store data. The advent of Cloud computing also coincided with general technological progress, particularly within the scope of the proliferation and further digitalization of the CITs and enhancements in hardware and software technologies. Please note that if we look back for a passé placed in the mid-2010s and further look and compare it from a period of circa 10 years, we went from using the old flip phones (which were proportionately expensive) to smartphones that presented us the possibility of having the whole digital world at the tip of our fingers: we now have a device that has full digital capabilities such as Internet access, can record and send pictures and videos, be used to write documents, etc. and still perform such as the basic functions of the original cell phone -the brick phones- to perform as a portable telephone. Smartphones are relatively affordable as they gradually become the universal form we now use to communicate, as they become a worldwide phenomenon in peer to Internet connectivity. Since they practically have the same functionalities, from the cheapest one to the most expensive one, if there is a mobile network you probably find that everyone holds a smartphone, no matter if you're in Silicon Valley or Tuareg country. This originated many new ways and extended the data collection opportunity to be extended worldwide to all parts of the civilized world, as the dividends of the progress of digitalization progressively supported the exponential and rapid growth digital economy to become data-driven with the addition of data analytics in a vaster universal of the *Internet of things*. With the proliferation of digitalization and advances on cloud computing and analytics, data began to be widely exchanged and a synonym for commercial profit. By then, companies realized that deleting data was like burning capital**:** We began witnessing a turning point with the affordable and profitable

advantages of data storage, collection and analysis had companies turned to become data-driven[96].

Lastly, the developments in storing and collecting data generated an aggregate push towards technological enhancement of analytic technical mechanisms to further enhance predictive analysis and guarantee the most efficiency of operations. You can´t extract value from data alone so the use of technologies such as *AI* and *machine learning* are pivotal for data analysis with the analytic outputs of prediction algorithms. Parallelly, neither value can't be drawn from algorithms alone and as mentioned in the first chapter of this dissertation -***From Algorithms to Artificial Intelligence***- it can be found, in somehow synthesized manner, that algorithms and data are being used throughout the general application of AI tools. However, although we may find algorithms and data to have a high economic value, the latter conclusions reiterate the fact that neither data nor algorithms generate value by themselves when isolated: so AI, as well as the digital/data driven economy, depends on both. It's the combination of the analytic nature of algorithms and data that generates value. The developments of AI for purposes such as identifying a disease pattern, predictive maintenance of machinery and fleets, identifying possible new medical drugs, finding the optimal route that takes the least time and uses the least fuel, the development of self-driving cars, etc. these activities without the analysis of data within the scope of processes such as machine learning and deep learning would simply not be possible. The advances in big data and analytics allowed the development of AI for specific/ narrow purposes as well as general purpose AI. The perpetual data accumulation and circulation is the current, or "data imperative", and

[96] In their revenue report to the US Securities and Exchange Commission for the final quarter (Q4) of the fiscal year of 2021, Alphabet (GOOGL) reported that advertising revenues—generated by the company's data-driven ad targeting services—reached $43.3 billion in the latest quarter, making up a estimated 82 percent of total revenue.

complies that modern organizations extract value by all means possible by *"Storing and studying people's everyday activities, even the seemingly mundane, has become the default rather than the exception"*[97]. To fully grasp the importance of data and algorithms to AI and the possible aggregated economic effects of these attributes we must in fact take into consideration how the different topics of *artificial mutual networks*, *deep learning* and *machine learning* allow AI to function as the motor to aggregate value by combining data with the predictive end of analytics means. But, beforehand, it's pivotal for us to understand the economic identity and characteristics and consequences of data representing the conductors to data-driven capitalism.

In conclusion, the transformation of data into a cornerstone of modern capitalism underscores its indispensable role in reshaping commerce and governance. The evolution from viewing data as a mere byproduct to recognizing it as a valuable asset has ushered in a new era of data-driven economics. The affordability and accessibility of data collection and storage, thanks to advances in cloud computing and technology, have empowered businesses to harness the potential of data. Furthermore, the fusion of data with analytics, artificial intelligence, and machine learning has unlocked boundless opportunities for predictive analysis, efficiency gains, and innovation. As we embark on our exploration of data's central role in the digital economy, it becomes evident that data is not just a commodity but the driving force behind agility, innovation, and competitive advantage in today's dynamic business landscape. Our next chapter, "The Cycle of Data Capital: Surveillance Capitalism," will delve deeper into the economic model that

[97] Angwin, Julia, and Jennifer Valentino-Devries. "New Tracking Frontier: Your License Plates." The Wall Street Journal, September 29, 2012. http://www.wsj.com/articles/SB10000872396390443995604578004723603576296. Accessed 02 May 2022

capitalizes on data within the context of surveillance capitalism, shedding light on its implications and ramifications.

2.4) The cycle of Data capital: do we currently live in an economic model assisted by *surveillance capitalism*?

2.4.1) Current remarks in a post-Covid-19 timeframe

> *"Capitalism, like sausage, is meant to be cooked by a democratic society and its institutions because raw capitalism is antisocial."*
>
> *(Shoshana Zubbof, **The age of surveillance Capitalism**, 48.)*

Today in the year 2022, as these words are being written, we encounter a particularly difficult time to live. After the turn of the third decade of the 2000s, we began fighting against the Covid-19 epidemic, extreme financial hardship and inflation and the invasion of Ukraine that hasn't just translated negative externalities at a social level but has sent fuel, wheat, corn and other commodities to be subject to fairly high price increases. The rate of inflation is exceeding the rate of salaries and citizens around the world have been losing their purchasing power parities. This also encompasses power losses in GDP levels. Times are really tough since the third decade of the 2000s has begun remaining a far cry from the times of economic expansion of the 1990s. Although the economy was on a good stroll on the path of recuperating from the 2008 economic crisis, with the advent of Covid-19, war and inflation the 2020s are likely to be disappointing rather than "roaring". The 2010s were a decade of protests around the world as it began with the Arab Spring, the famous 2011 London riots, Brexit agitation, 2016 US election agitation, the yellow vests processes all around Europe in particular France, protesters in Central and South America as the cases of Venezuela and Colombia, in the Middle East, Hong Kong, etc. although there was a wide variety of motives such as to fight climate change, corruption, racism, economic welfare etc. the 2010s were turbulent decades particularly sparked by the ones who fight against inequality in either social, political and

economic terms. The 2008 recession sharpened the inequality and particularly affected those who are members of the middle and lower class who testified to the widening of the gap between themselves and the elites[98]. This was expressed throughout the past decade, particularly within the scope of ideas that increased the volatility of political paradigms such as the disruptive toward the status quo paradigms exemplified by the advents of the 2016 election of Donald Trump and Brexit amongst other political solutions that swore extreme and disruptive solutions against the problems such as of a foul government, corruption, distribution of wealth due to the disparity caused by the concentration of wealth to the elites on top, low economic growth especially when compared with players like China who play by their own rules (and not by international institutions), etc.

The fact is that I'm not going to prolong myself enumerating the many reasons why citizens have been exposed to a more volatile and vulnerable economic environment since the 2008 crisis but there is a tireless list of topics to mention when appointing the blame to the failure of neoliberalism. There are all sorts of neoliberalism failures that also have been appointed by some politicians, who mask themselves as anti-establishment, like Trump, UK's Nigel Farage and Hungary´s Victor Orban[99]. The fact is that**:** yes, neoliberalism is ~~failing~~ lacking! It's widening inequalities as it promotes processes of outsourcing and lowers the demand for unskilled labour affecting middle- and lower-class workers such as the case of blue-collar workers. This is generating negative economic externalities for the whole labour market as it diminishes the net worth of those with fewer skills and educational levels while simultaneously contributing to unemployment rates going up, living standards going down and the proliferation of tax-cutting austerity

[98] See OECD. "An Overview of Growing Income Inequalities in OECD Countries: Main Findings." OECD, 2011. https://www.oecd.org/els/soc/49499779.pdf. Accessed May 2, 2022
[99] See Miklós, Sebők, and Jasper Simons. "How Orbán Won? Neoliberal Disenchantment and the Grand Strategy of Financial Nationalism to Reconstruct Capitalism and Regain Autonomy." Oxford Academic. Socio-Economic Review, October 29, 2021. https://doi.org/10.1093/ser/mwab052. Accessed May 3, 2022

measures affecting the assurance of welfare by the state. This is generated by a sort of domino effect paradigm that has been characterizing the livings of citizens, particularly in Western countries such as the United Kingdom and the USA. Shoshana Zubbof[100] assures that throughout the literature of the French economist Thomas Piketty[101], this systemic economic oppression of the minorities system is being perpetuated due to the return rate of capital (***r***) is encompassing the rate of economic growth (***g***), as Zubbof notes that: *"This tendency, summarized as r > g, is a dynamic that produces ever-more-extreme income divergence and with it a range of anti-democratic social consequences long predicted as harbingers of an eventual crisis of capitalism. In this context, Piketty cites how financial elites use their outsized earnings to fund a cycle of political capture that protects their interests from political challenge"*[102].

Eventually, the latter postulates that the funding of this path is supported through by the elites that ascribe politicians and parties to rise by influence of the public and political capture in trade of an agenda that favours the ultra-rich by tax cuts, new financial regulations and shrink entitlements[103]. This means that our democracy is at the expense of oligarchic interests that are beyond the mechanisms of democratic consent. Zubboff also points out that many scholars have been describing these new conditions as sort of a neo-feudal state where your chance in life depends on wealth rather than the derived merit from personal achievements. People fundamentally desire democracy to be arranged on a more social matrix where democracy presents itself in a more direct and horizontal form. In due course, the latter tends to fallout in the discontentment of the people that

[100] See Zuboff, Shoshana. The Age of Surveillance Capitalism. PublicAffairs, 2020.
[101] See Piketty, Thomas. Capital in the Twenty-First Century. Translated by Arthur Goldhammer. Cambridge, MA: Belknap Press of Harvard University Press, 2014.
See Piketty, 334-35
[102] Zubbof, 46
[103] See Nicholas Confessore, "The Families Funding the 2016 Presidential Election," New York Times, October 10, 2015, https://www.nytimes.com/interactive/2015/10/11/us/politics/2016-presidential-election-super-pac-donors.html. Accessed May 03, 2022

recently has been expressed in many forms of protests such as the Occupy Wall Street movement, London riots and Yellow Vests movement. The argument evolves to the point in which "we" the people are succumbing to lose control of our individual interests (and in greater degree of our own live) by yielding to the political and economic spheres that are strained by the elites, as Shoshana Zuboff points out to consider "the second modernity" paradigm which considers the present moment that we're living in as a reward of capitalism system that privileges the elites.

Zuboff quotes German philosopher Zygmunt Bauman as he stigmatized that the innermost contradiction of our times (the second modernity), is described by *"the yawning gap between the right of self-assertion and the capacity to control the social settings which render such self-assertion feasible. It is from that abysmal gap that the most poisonous effluvia contaminating the lives of contemporary individuals emanate."*[104] The latter words, citated by Zuboff but written by Bauman, denote the instability of our times and throughout a relatively recent process of digitalization, which relies on data that further expropriate our privacy in favour of commercial profits as its occurrence imperative driven form for data-driven capitalism. This of course makes us further inquire about the future, what German sociologist Ulrich Beck[105] would describe as de departure towards a time and space beyond its classical industrial design: *the third modernity*. The second modernity grew individuals towards individualization, to develop a dependence on technology which will further intensify and to a socio-moral mass where traditional values aren't on the forefront.

However, the logic that plays the elites as "puppeteers" nature not only what tends to propel to forms western social disorder but is what fuels the propagation of populism

[104] See Zubbof, 50
[105] See Beck, Ulrich, and Mark Ritter. 1992. *Risk society: towards a new modernity*. London: Sage Publications.

in Europe. However, most of these arguments are refuted by Jonah Goldberg perspective in his book ***"The Suicide of the West."*** Although Goldberg, does not specifically delves in the topics of technology and surveillance capitalism he dismisses these critiques as he offers a perspective in his book ***"The Suicide of the West"*** that overlaps with Zubbofs´s concerns about elite influence and erosion of individual interests. Goldberg arranges his argument on contradictory conservative grounds mostly focused on cultural and ideological factors that contribute to the erosion of cultural and philosophical foundations that serve as the underpinnings to western society. But as far as Piketty´s and Zubbof´s argument in which capitalist system perpetuates a dynamic (latter summarized in r > g) that widens inequality by protecting the interests of elites through their funding a cycle of political captures, Jonah Goldberg ideas denounces these ideas in a 2014 article response to the book lunch of Piketty´s ***"21st century Capital"***[106] as "Marxist echoes"[107] of Anti Capitalism Intellectuals (the ones who are supposed to dig the grave for capitalism). Goldberg denotes that to considers that no one has really the power to buy the elections and subsequently to rig democracy towards a system based on the exploitation of an homogenous political class as he states: *"(…)A third claim—one can't call them arguments because they don't rise to that level—is that the super rich will rig democracy to their advantage. This, too, has a faint Marxist echo, featuring as it does the assumption that capitalist overlords form a homogenous political class bent on exploitation. One must only read the newspaper to know that this is nonsense on stilts. At this very moment, George Soros, Tom Steyer, and other liberal billionaires are in a hammer-and-tongs political battle with Sheldon Adelson, Charles and David Koch, and other conservative or libertarian billionaires. And the evidence that either side has the*

[106] Goldberg, Jonah. "Mr. Piketty's Big Book of Marxiness." Commentary Magazine, September 3, 2015. https://www.commentary.org/articles/jonah-goldberg/mr-pikettys-big-book-of-marxiness/. Accessed September 15, 2023

[107] Goldberg, Jonah. "Mr. Piketty's Big Book of Marxiness." Commentary Magazine, 2015.

power to buy elections is discredited almost every November. This is not to say that our democracy couldn't be healthier or that wealthy special interests do not cause real problems, but America is hardly being run today by characters out of a Thomas Nast cartoon. It's being run, instead, by the son of a teenage single mother from Hawaii, the son of a barkeep from Ohio who became speaker of the House, and a miner's son from Nevada who grew up in a shack with no running water before becoming majority leader of the Senate—none of them born into wealth, to put it mildly."[108]

Jonah Goldberg proceeds in his book titled ***"Suicide of the West: How the Rebirth of Tribalism, Populism, Nationalism, and Identity Politics is Destroying American Democracy"*** that the manifest creed that plagues America and Western society are forms of tribalism as they a) are shield and or the divisive rhetoric of "us" and "them" and b) as tribalism is evocative of our nature it also triggers a mentality relating to a sort of survival instinct based on what Darwinian need for comparative advantage[109]. Just as species adapt to their environments to gain a Darwinian advantage, individuals and nations seek their comparative advantage in economics to thrive through specialization and trade and the consequent search for a better life and better political regime. Goldberg's work focused on an early stage to pursue the arguments that cultural and ideological shifts are potentiating a greater negative impact in the Western way of life as its eroding institutions that such as family, community and faith that help individuals to find their own sources of meeting and belonging and avoid collectivization. This is pushing individuals to procuring to find divergent solutions to the paradigmatic pursuit on "How should we live?" on future oriented replacements for liberal democratic capitalism (as its ancient and reactionary) in other sounding "*isms*" bestowed upon the forms of tribalism in a sort

[108] Goldberg, Jonah. "Mr. Piketty's Big Book of Marxiness." Commentary Magazine, 2015.
[109] Goldberg, Jonah. "On Socialism." Preface. In Suicide of the West, 9–13. Random House US, 2020.

drive for motivating our natural desire for unity in the expressed statism forms that promote Identity politics, Populism , Nationalism, and Socialism.

As Goldberg states the emphasis on emotions and identity, along with the elevation of feelings over reason, undermines the well-being of the broader political community by promoting a harmful form of group solidarity. What's his proposed alternative? A recommitment to fundamental conservative values: *"Modern American conservatism is a bundle of ideological commitments: limited government, natural rights, the importance of traditional values, patriotism, gratitude, etc. But underneath all of that are two bedrock assumptions upon which all of these commitments stand: the beliefs that ideas matter and that character matters. We can have debates about what ideas are important and what good character means. Indeed, the reason we can have debates is that we believe that ideas matter"*[110]. Goldberg acknowledges the fact that Liberal Democracy is the only form of political regime that guarantees and protects the individual right on what I would call the pursuit of a better life (*How Should we live?*) … The pursuit of happiness! So, what Jonah Goldberg proposes is a new form of conservatism that conserves the pluralism of institutions and the importance of civil society by preserving the classical values of the liberal order as individual liberty, limited government, and free-market capitalism.

Reflecting on the well-known literature of authors such as Zigmund Bauman, Ulrich Beck and Anthony Giddens is a crutch to intellectually inquire about the framing of *third modernity* that will eventually transcend to reflections on topics such as Are we becoming obsolete? Can an ordinary mortal lead a meaningful flourishing life? What is the play that data-driven capitalism is going to assume? This dissertation focuses on the

[110] Goldberg, Jonah. "On Socialism." Conclusion. In Suicide of the West, 345. Random House US, 2020.

present effects of technological progress with AI in greater focus and does not assume essentially the nature of a predictive analysis on future effects of AI, so given this purpose, let´s concernedly address the present time where Big Tech monopolist market structures prevail beyond the free-market logic over to surveillance capitalism.

Joseph E Stiglitz, in a 2016 article for the World Economic Forum[111] points out that the views of many great economists of the 20th and 21st centuries are somehow epitomized in the way that Joseph Schumpeter[112] described "creative destruction", causing Stiglitz to consider them flawed and empirically refuted with strong evidence. "Creative destruction" relies on the assumption that the market constantly relies on a renovating mechanism - fuelled by an environment of constant innovation and competition - that supposedly assured economic efficiency and that all monopolies would remain temporary throughout high degrees of market competition. Stiglitz points out that the process of creative destruction failed to assure the creativeness and competitiveness of current markets "*are characterized by the persistence of high monopoly profits"*[113] as they were steered away towards laissez-faire, furthering the encapsulation of the political and economic spheres aggregated distribution of prosperity and efficiency for oligarchic and monopolistic interests. The fact is that the winners of the current stages of digitalization are the companies that understand the real value extracted from data and have taken advantage of the new commercial business model that they have been constructing since the advent of the "Internet of things", particularly the advents of the multisided business models and the exploration of the network effects. Therefore,

[111] See Stiglitz, Joseph E. "Are Markets Efficient, or Do They Tend towards Monopoly?". Accessed May 03, 2022

[112] Schumpeter, Joseph. "7. The Process Of Creative Destruction." Essay. In Capitalism, Socialism and Democracy, 97–102. New York: Harper & Bros., 1942.

[113]Kennedy, David, and Joseph E. Stiglitz. "Law and Development Economics: Toward a New Alliance." In Law and Economics with Chinese Characteristics: Institutions for Promoting Development in the Twenty-First Century, edited by David Kennedy and Joseph E. Stiglitz, Oxford University Press, 2013.

companies such as Amazon, Google, Tesla, eBay, Microsoft, etc. have become richer and more powerful than compared to some nation-states. The argument that "creative destruction" would guarantee the distribution of prosperity and efficiency throughout the generated market effects didn't predict the "big tech" monopolistic and oligopolistic structures because frankly, no other company has reached such a high degree of economic value and importance around the globe, so they failed to predict that: These companies have become "too big to fail" as their importance for the economic, political and social spheres surpasses the limits of political institutions powers**.**

The recent technological development, the efficiency of a new business model that relies on datafication and the rapid pace of "the digital transition" accelerated with the advent of the COVID-19 epidemic created and particularly prosperous environment for the unprecedented advances in data-driven capitalism. COVID-19 restrictions forced us to transition from a physical world such as the workplace environment towards the digital sphere within a timeframe of months and days. This allowed the exponential growth of the risks and challenges towards our private data because of the force shift that boosted digitalization. Shoshana Zuboff wrote the book before the COVID-19 pandemic, so Zubbof like everyone else cannot predict the impacts of this pandemic crisis that we 2022 were still living in, although in a way much closer to the before COVID-19 normality. Still, in a 2020 podcast for OECD[114], Zuboff notes that the pandemic crisis enhanced the process of "surveillance capitalism" as it has driven up digital inputs such as our online social and workplace interactions, it forced has to buy online products (as the cognitive restrictions closed many stores) and it even allowed the government to use technology in order to track us and mitigate the effects from the pandemics. The evolution of capitalism,

[114] See OECD (2020), "What data and digitalisation could mean for your democratic future with Shoshana Zuboff", OECD Podcasts, Duration: 26:16, OECD Publishing, Paris, https://doi.org/10.1787/278260ea-en. Accessed May 03, 2022

the historical emergence of psychological individuality and the conditions for general human development conducted towards situation that has some resembles with the described by Zuboff as "*surveillance capitalism*": an economic system centred around the intrusive capitalization of personal data with a core purpose of profit-making. Data is in fact "the new oil"[115] but its uncontrolled extraction and the further processes of analytics promise to overthrow humanity and democratic conditions of existence as the enemy is not data itself but the way "Big tech" companies that purposely target data analysis of human nature as a free raw material and form of power. These companies deprive us of our privacy using hidden mechanisms that unwaveringly shield our reactive capacity to fight against their economic interests as "big tech" privilege profiting by intrusive means over sovereignty, democracy and the intrinsic qualities and value of humanity. Tech is used to quantify the details of our social life as per the people who surround us and the relation with them, our life events, what we like, what we buy, etc. data surveillance is a model of data worked that represents reality.

2.4.2) Is data the "new oil"? Why does data require a different mindset?

> *"Data is the new oil. It's valuable, but if unrefined it cannot really be used. It has to be changed into gas, plastic, chemicals, etc to create a valuable entity that drives profitable activity; so must data be broken down, analysed for it to have value." — Clive Humby, 2006*

[115] See "Is Data the New Oil? - European Parliament." European Parliament. EPRS | European Parliamentary Research Service, January 2020. https://www.europarl.europa.eu/RegData/etudes/BRIE/2020/646117/EPRS_BRI(2020)646117_EN.pdf. Accessed May 04, 2022

The catch phrase “data is the new oil” is one of the most widely used metaphors to comprehend the economic infrastructure of the current digitalization paradigm. Oil is understood as an economic resource or commodity that is valuable because we found ways to extract value from crude oil as the starting point for many wildlife products such as plastics, fuel, lubricants, etc. Data shares that same necessity to be refined but in a much more complex form since after collecting raw data from the sources it requires extensive pre-processing before being used for analytical purposes. This is the main similarity between our and data as that they can only generate value if in a usable form to use as a fuel for AI and analytics. The fact is that it assumes a very distant economic identity the oil and as previously said data assumed a role as a form of capital for digital autonomy in the same way as per the exponential growth of digital services (such as online payment services and social networks) and e-commerce. Data analytics turns the activity and interactions of consumers within the Internet of things (the network effects) into Algorithm driven strategies for creating value. To understand the similarities and differences between data and oil, I have come to the following conclusions that expound why the two have very little in common:

The first topic I would like to address is that data assumes a unique economic characteristic as it assumes a Non-rivalrous, Non-fungible and Experience good identity**.** As the centrepiece of data can be used for very different approaches simultaneously as read by within different analytical intents and algorithms. So unlike other resources, like oil, and forms of capital, the consumption of data doesn't erode quantity and exclusivity. This implies that the same piece of data, unlike oil, can be used by many parties at the same time as well as the fact that that same piece of data could be used in perpetuity as data is virtually infinite. If we look at the current digital activity and the continuity of exponential growth, we will never stop creating data as we

continue to datify activity, unlike oil which is a finite amount. The second economic characteristic of data is that it's non-fungible. Non-fungible goods comprehend that a unit of the good in question can be substituted by another. In the case of commodities you can substitute each unit of the good for another, such as in the case of barrels of crude oil, each piece of data complies with different information so it´s unique. The nonfungible criteria presume the flexibility and reach of the multisided business models generated by the digital economy that comprehend data trading to data brokers, as its unique information compiled in digital files. The third economic characteristic of data is that, unlike a physical item, data is an experience good as it attains value not by the possession but by accessing the information. As Hal Varian[116] notes, rather than the criteria of ownership in order to determine who has economic control of an asset, data implies a logic of accessibility rather than ownership. The latter also implies the necessity of companies to protect the accessibility of data to select for which circumstances and who will generate value from that data unity. Controlling data is the factor that determines exclusivity to access that information via the technological world, as per the cases of cyberattacks.

Assuming the above economic characteristics inherent to data and assuming the differences from Oil, we may furthermore conclude that unlike oil data created now is likely to persist upon a limited timeframe that's subject to the interplay of the role of the predictive value of data and public policies about privacy. The fact is that digital files after being created are difficult to erase, unlike analogue records which have a physical component that guarantees easy displacement. As analysed previously, companies and all that other data on a bigger scale coincidentally reduced storage costs, allowing small

[116] See Varian, Hal. “Artificial Intelligence, Economics, and Industrial Organization.” NBER, July 23, 2018. https://www.nber.org/papers/w24839. Accessed 06 May, 2022

firms with scarce resources to have the computing capability that allows them to store data practically indefinitely. Unlike having more oil consumed by a combustion engine doesn't necessarily translate to better performance, more data and analytic capabilities translate towards an added robustness to the predictive capabilities of data. Catherine Tucker is a well-established researcher that focus on the usage of data, privacy, algorithms, AI and numerous other political and economic questions that arise within this current stance of the digital economy. Tucker formulated that we need to ask one of the essential questions in order to understand the value of data´s predictive power: *How Long Will Data's Predictive Power Persist?*[117] Tucker's literature concludes that the predictive power of data depends more on understanding the aftermath dynamics of privacy than the factors relative to storage such as costs as in the spectre of a longer timeframe, so it's fair to conclude that there is predictive power may diminish. Chiou and Tucker (2014)[118] argue that while search engines may have reduced data retention tools more restrictive privacy laws of the European Union, restrictive data retention doesn't necessarily reduce the success of search engines as Internet searches are focused on an individual necessity/curiosity (such as finding the address for a restaurant or who was the 20th US Pres.) or focus on new events/phenomenon's that couldn't have been predicted previously (such as natural catastrophes or the infamous 2022 Oscars slap). So, in conclusion, less lengthier data retention may induce losses on the predictive power of data, but it really doesn't significantly threaten the success of AI as it is good enough for shorter timeframe capabilities and our personal preferences and tastes tend

[117] See Tucker, Catherine. "Privacy, Algorithms, and Artificial Intelligence." NBER. National Bureau of Economic Research, January 10, 2018. https://www.nber.org/books-and-chapters/economics-artificial-intelligence-agenda/privacy-algorithms-and-artificial-intelligence. Accessed 06 May, 2022

[118] See Chiou, L., and C. E. Tucker. 2014. "Search Engines and Data Retention: Implications for Privacy and Antitrust." MIT Sloan Research Paper no. 5094-14, Massachusetts
Institute of Technology

to vary with age. To exemplify the latter, Chiou and Tucker[119] argue that if we proceed to analyse the web browser behaviour pattern at age 40, it cannot be predicted by the analysis of the same factor when an individual is 20 years old as the construction of human identity is subject to the changes of time and circumstances. Tucker also mentions that one of the main aspects that which we might withdraw great predictive value from data is from the collection and usage of genetic digital data as, unlike the above case of the unlikely predictive capacities of web browsing behaviour, the genetic data of a 20-year-old will be used to predict with almost perfect precision the future genetics of the same individual when he turns 40.[120]

To sum up and conclude, although we just compare data and oil in the above paragraphs and point out some similar aspects and differences, data requires a very different mindset so you should approach data and oil on a comparative basis. Oil revolutionized our economy since the early processes of petroleum refinement in the first half of the 19th century and has become a dependent part of the global value chain as it is the most used energetic resource around the world. The whole global economy depends on oil for transportation, industrial and production electricity as the value chain of petroleum and its by-products implications on gas prices control GDP in a such dimension that influences inflation, economic growth, income and consumer spending. Both oil and data are immensely valuable assets and guarantee the functionality of our economic infrastructure. But the key to grasping why we shouldn't compare oil and data is that of realizing the economic infrastructure has become digitally oriented, and data represent a higher economic value than ever passing the value of the additional

[119] See Chiou and Tucker, "Search Engines and Data Retention."
[120] As discussed in articles such as http://www.nature.com/news/2008/080624/full/news.2008.913.html , DNA´s change may be somewhat predictable
See Whitfield, J. Lifetime lessons of DNA change. Nature (2008). https://doi.org/10.1038/news.2008.913 Accessed 07 May, 2022

commodities and becoming a form of capital that basically allows companies to use data to improve everything, day by day. This translates well to why there is an imbalance of power when we treat data like oil as while both are powerful resources, the accessibility of data and high analytic/ predictive capacities tend also to perpetually create more data that can be used for practically anything computers and algorithms can process. Essentially there are two trends that may explain well why data has become more valuable than oil. Even if we ought to compare the value of oil and data while considering that both share a very narrow way of performing a comparison and an unequal contribution to today's economic infrastructure, **we can attest that data´s creative value has comparatively passed the value of oil**:

- The first ascertain of data surpassing oil in terms of economic value is demonstrated within the current digital business model core reliance on data, we can **corroborate that data has a greater creative value than oil**. This conclusion is easily drawn by the fact that the market cap of big data companies such as Google (Alphabet), Microsoft, Apple, Amazon, Tesla, etc. is comparatively surpassing and in some cases is already surpassed the comparative Market capitalization value of oil and gas companies such as ExxonMobil, Saudi Aramco, Chevron, Shell, etc. Data has become pivotal to any of the top 10 most valuable companies in the world (please review Bylund, 2022)[121], in fact, the bulk of these companies are "early birds" who soon figured out exponential ways to improve their growth, productivity and business models by using data analytics and acting as data brokers in a trade-off service between their

[121] See Bylund, Anders. "The World's Most Valuable Companies from 2000 to 2022." Nasdaq. All-new World Reimagined podcast, April 21, 2022. https://www.nasdaq.com/articles/the-worlds-most-valuable-companies-from-2000-to-2022. Accessed 12 May, 2022

business goals and the users of practically everything that´s digital privacy. *"In two decades and change, we've seen the business world shift away from oil producers and industrial-engineering companies while software, online services, and consumer electronics soared higher and higher."*[122] Data is the centrefold of the digital economy while oil is an important resource but not a form of capital itself and it´s no longer a focus for the economy that´s driven by innovation, creativity, efficiency and sustainability. Oil is still a necessity for powering the value chains, but it simply isn't viewed anymore as a motor for endogenous economic growth. This brings me to my second point on why oil drags behind compared to data.

- The current business models of the digital economy wager on a process of energetic transition. **Data is the key to transitioning the economy into a digital sphere and into clean energy, where higher energy efficiency and sustainability are procured.** The digital transition promotes a universe where data trading is part of the supply chain in a highly complex energetic system that requires highly developed infrastructures, high skilled maintenance and more efficient means to generate and transmit power to the grid. Data is crucial to driving innovation as it promotes tools to develop building blocks for the energy sector in terms such as procuring more efficient planning and the subsequent implementation of sustainable grid designs with the implementation of energy from renewable sources, performance assessments (this is one of the many areas that algorithms promoted by

[122] See Bylund, 2022

AI tools and data are truly efficient) and in the creation of covert sources to the consumer's needs pointing out a general principle of the campaigns of energetic transition: *the overall flexibility of the electricity system of tomorrow*[123] with the added financial opportunities amongst many other new openings in a wider range of opportunities. **Data is being used to accelerate the digital and energetic transition overthrowing oil in a spinoff effect**. Data is not only to promote the general efficiency of the products (i.e., with product design) and in the consumption, generation and sustainability of the electric grid but it's also been used in a very important role as the coordinator for the cybersecurity to improve the resistance and resilience in consequence of cyberattacks. Data-driven decisions generate efficiency and sustainability and are working effectively towards an energetic greener model, combating the climate exchange, and the consumption of less oil, perhaps we´ve already achieved its tipping point[124].

[123] See "In Focus: The Digital Transformation of Our Energy System." European Commission. European Commisson, January 18, 2022. https://ec.europa.eu/info/news/focus-digital-transformation-our-energy-system-2021-dec-16_en. Accessed 13 May, 2022

[124] See "The Future of Oil." The Economist . The Economist Newspaper, November 24, 2016. https://www.economist.com/special-report/2016/11/24/the-future-of-oil. Accessed 13 May, 2022

2.4.3) Remarks on advanced analytic approaches and extraction techniques: Big data, Deep Learning and machine learning economic value

> *"Learning algorithms are the seeds, data is the soil, and the learned programs are the grown plants. The machine-learning expert is like a farmer, sowing the seeds, irrigating and fertilizing the soil, and keeping an eye on the health of the crop but otherwise staying out of the way."*
>
> *— Pedro Domingos, The Master Algorithm: How the Quest for the Ultimate Learning Machine Will Remake Our World*

Software is progressively being embedded in the wider varieties of products that go beyond the perception of "Joe Shmoo" that bleakly regards them as simple home supply devices such as microwaves, automatic vacuum machines, fridges etc. can analyse data from the user's interaction with the device and the analysis of that data creates value. For example, the Roomba vacuum robot is not a simple device used for vacuuming houses as it is vacuuming more than you think their iRobot product line maps the floor pan of their customers houses and it´s company expressed that their intent to capitalize that information by trading it to third parties[125]. This trade-off would eventually be a windfall for marketeers as it wouldn´t just pattern the layout of our homes but in a certain extent it could be used to further pattern the lives of those who live behind those walls as it could deduce our income level, whether do we need an armchair in our living room or a closet in our bedroom, our marital status and if we have kids or pets. This new computing environment that secures that data is captured from more sources and with the advent of

[125] See Reilly, M. (2020, April 2). Your Roomba is also gathering data about the layout of your home. MIT Technology Review. Retrieved July 5, 2022, from https://www.technologyreview.com/2017/07/25/150346/your-roomba-is-also-gathering-data-about-the-layout-of-your-home/ Accessed 5th of July, 2022

cloud computing translates to a state in which data-capital computing determined that enterprises should reinvent themselves in order to survive as they could not throw away the broad applicability of analytic economic observations and the predictive insights derived from data. The accessibility of software and advances in computing power generated a principal of data equality in which companies' goods accommodate and trade the service of information in its original forms for extended periods. It's important to remind us within the spectre of data greater diversity either that without proper strategies and mechanisms that allow you to get *"the data you want into the shape you need with minimal time, cost, and risk"*. This is what Erik Brynjolfsson and Andrew W. Lo define in the previously mentioned MIT report[126] definition for data liquidity.

Cloud providers and data brokers share a very competitive atmosphere and they offer services at lower costs while not only ensuring the performance of their hardware but even offering software solutions that complement the analytic approach and extraction techniques as they take part of the superhuman abilities of "machine learning". This means that companies don't need to develop and by different software as services provided by machine learning like image recognition, natural language processing throughout text and audio, data exploration and processing and even the analyses of data sets to further enhance machine learning models, etc. Now keep in mention that technology might supply you with the right tools to collect, store and analyse data but it doesn't guarantee that you have the expertise to develop sustainable business solutions and to a further extent it does not necessarily ensure that the data itself as relevant reliability for analytic and predictive business motives. Data can have an undesirable bias when dealing with issues and challenges such as:

[126] See Brynjolfsson and Lo "The Rise of Data Capital".

a) **Data scarcity**, once there are barriers that make data hard to access and triggers fewer entries than desirable to draw outcomes for analytic purposes.

b) **Data sparsity** is when you have an overrepresentation of a certain type of class in your datasets, affecting the quality and therefore reliability of the data.

c) **Limited training data** available in order to train neural networks necessary in fields such as medical research, autonomous driving, video surveillance and image recognition, marketing, etc data sets can be limited by various factors such as the typical privacy concerns and generally we can establish: ***the bigger the sample, the better the model***. A typical solution for this problem is data augmentation as it uses AI to generate more data and analytically categorize the available dataset. It's cost efficient and requires very little or no human input while figuring out an adequate solution in very little time for enhancing deep learning models.

d) **The lack of relevant data** is another challenge but only regarding the size and the quality of the training dataset can be held and imposing problem of representation holding back relevant data necessary to improve deep learning models. Data augmentation is the only feasible solution for solving representation problems to analytically capture and augment accurate representative models to develop deep learning capabilities.

e) **Model overfitting** happens when deep learning models fail to generate pragmatic accurate predictions due to poor generalization performance as they use models of datasets that fit too close to the training data. So, when new data sets are introduced, the previous large amount of irrelevant data

holds back the inputs of the new datasets and turns the model predictive capabilities useless. Data augmentation keeps the ship on an even keel as it inputs relevant data in amounts that will improve the datasets-derived capabilities of generalization.

f) **An Unbalanced Dataset** is a considerable challenge especially while dealing with real-life implications such as fraud prediction (frauds happen with a lower occurrence than genuine transitions), natural disaster predictions, uncommon health problems, recognizing animals from endangered species, etc. This challenge proceeded by not getting enough optimized results that contain important information for predictive recognition of that class due to a low number of observations of that class for the machine learning algorithm. Again, this problem can be sold by augmenting data as it corrects the balance of datasets by creating more data.

Data augmentation generates new data points from the existing data allowing the training of datasets and improving the analytic performance and outcome predictive capabilities of machine learning models. Choosing the integration pattern in the data pipeline refers to the way data is fed, processed and transformed within the AI system. When and how we augment data by establishing the integration pattern of the *data pipeline* may essentially draw our strategical development in two different subsets of AI: **Machine Learning** and **Deep Learning**.

A. In Machine Learning models, the integration pattern of the data pipeline typically involves transforming the data into a numerical representation that can be used as input to the ML algorithm, as it relies on mathematical algorithms and statistical models to make predictions or decisions.

B. On the other hand, Deep Learning models are a type of AI that uses artificial neural networks to make predictions or decisions. In DL, the integration pattern of the data pipeline typically involves transforming the data into an image-like representation that can be used as input to the neural network.

Overall, the general-purpose data pipeline system controls the movement of data from one or more systems to the next while processing, extracting, transforming, validating, protecting its integrity and combining data in order to shape the data streams to be valuable for multiple analytics destinations and means such as machine learning depending on "the nature of the project and business objectives"[127]. In some cases, in order to proceed with the integration of the data pipeline, simple data augmentation techniques such as random flipping or rotation may be sufficient, while in other cases, more complex techniques such as synthesizing new data based on the existing data or using generative models may be necessary. Generally, it has been shown that:

a) Machine Learning is best suited for projects that involve structured data, where the relationship between the inputs and outputs can be easily defined. This makes it well-suited for applications such as regression, classification, and clustering, where the goal is to make predictions based on existing data. Machine Learning models are generally simpler and faster to train and are therefore more computationally efficient than Deep Learning models. Additionally, they often require less data to achieve good results.

b) Deep Learning is best suited for projects that involve unstructured data, where the relationship between the inputs and outputs is more complex. This makes it suited for applications such as image recognition, natural language processing, and

[127] "What Is a Data Pipeline? Definition and Faqs." HEAVY.AI. Accessed July 20, 2022. https://www.heavy.ai/technical-glossary/data-pipeline.

speech recognition, where the goal is to learn patterns and features in the data that can be used to make predictions. Deep Learning models are capable of learning complex relationships between inputs and outputs and can often achieve better results than Machine Learning models, especially in cases where there is a large amount of data.

c) In terms of business objectives, Machine Learning is often the preferred choice for applications where the goal is to achieve a high level of accuracy and efficiency. On the other hand, Deep Learning is often the preferred choice for applications where the goal is to achieve breakthrough results in areas such as image recognition and natural language processing.

2.5) Retrospection and Progressive Analysis II

This dissertation´s second section focused on the use of digital monitoring and its implications for new business models. Because of the data-driven economy's reliance on data, new commercial tactics and key aspects of new business models have emerged. This chapter focuses on determining the economic worth of data and how does the new business models aggregate liquidity. As data becomes a powerful form of capital, concerns have been raised about the consequences of widespread data collection and surveillance capitalism, highlighting the significance of ethical issues and privacy safeguards. This section of the outgoing dissertation highlights *how does the economy turned data driven* and *how data began to be capitalized by all sectors of the economy*. As "Big Data" practically captures and appropriates all of our individual online footprint such as the case of our social data, search engine results and preferences, what we buy online, etc. The new business models rely indeed on the exploitation of a continuous data-stream that practically capitalizes on human life with very little or no limits.

Businesses across all sectors and consumers are practically totally embedded within the dynamics of the digital business models which rely on how easy and efficient technology allows us to communicate and grew accustomed to the simplified manner it is to collect, analyse and process data. The digital economy has become the economy itself accordingly it is important to recognize the totalizing shift across all sectors of the economy such as retail, financial services, education, agriculture, transport and logistics and manufacturing. All of the current economic sectors depend on digital advertising, e-commerce, business-to-business solutions (where a business sells products and services to other businesses typically propelled by web-based commerce), data analysis and profiling, software to maintain the efficiency and maintenance of machinery and vehicles,

online customer support, and many other common features that represent the influence of the digital business model. Although the realm of this dissertation isn't directed towards the digital economy itself topics such as automation and advanced robotics in manufacturing plants, the new sources of collecting and storing data as well as big data analytics are products of artificial intelligence and in particular supplemented by deep learning and machine learning activities.

The following challenge this thesis seeks to address is: *How does appropriation of our digital footprint challenge the notion of elite influence on societal disarray and populism?* Populism and dystopian authors, such as Shoshana Zubbof, regard that “failures” of neoliberalism, including income inequality and wealth concentration, is leading us to a neo-feudal state where wealth determines life prospects. Shoshana Zuboff's analysis highlights the influence of financial elites in this system and the role of “digital surveillance” to bind the political, economic and social spheres. However, Jonah Goldberg, in "The Suicide of the West," challenges these ideas, denying that elites orchestrate societal disarray and populism. He emphasizes the role of tribalism and proposes a return to conservative values to counter these challenges and preserve pluralism and civil society within the liberal order.

As we transition to our next chapter, "Tech, State, and Utopia – Regarding AI, Trade, and International Macroeconomics," we delve deeper into the intersection of technology, governance, and economics. The role of data, advanced analytics, and AI in shaping international trade and macroeconomic policies becomes increasingly critical, offering both opportunities and challenges for the global landscape. Our exploration will shed light on the intricate web of relationships between technology, state actors, and economic paradigms, underscoring the importance of informed decision-making in an era dominated by data and algorithms.

CHAPTER III: Tech, State and Utopia –Regarding AI, Trade and International Macroeconomics

3.1) Digitalization, the new geographies of production and impacts on Global Value Chains

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"As the use of AI increases, the AI technology and the digital ecosystem in which it is embedded needs to work seamlessly across international borders. A global logistics company, for instance, may rely on AI to optimize its supply chains and manage its warehouses and transport fleet, requiring its AI technologies to operate seamlessly across borders in real time. A gig economy worker may be assigned tasks and managed via algorithms through a platform company based in another country and will want to know that they will be treated fairly and will have means of redress if things go wrong. A consumer purchasing a smart speaker manufactured abroad and will want to know that it meets security and privacy standards, and that the AI software will be regularly updated."[128]

*Emily Jones – "**Digital Disruption: AI and International Trade Policy**"*

In the previous chapters of this dissertation, I pursued to describe the contemporary wave of digitalization and how AI and ICT's can revolutionize productivity and enhance economic interactions in general. However, we must also address a similarly important systemic change to the relationships between economic actors the emergence of digital platforms as a new mode of intermediation that can be linked to the Global Value Chain (GVC)/ Global Production Network. The role of digital platforms leads the processes of real-time data exchange and communication among the different geographies. The latter not only exponentiates interfirm relations, technological transfer and firm level capabilities as it. In essence, GVC´s are the connection element between the raw material and the final consumer as Kaplinsky and Morris (2001)[129] define ***Global***

[128] See Jones, Emily. "Digital Disruption: Artificial Intelligence and International Trade Policy." Oxford Review of Economic Policy 39, no. 1 (2023): 70–84. https://doi.org/10.1093/oxrep/grac049 April 4th 2023.
[129] See Kaplinsky, Raphael, and Michael Morris. 2000. Handbook for Value Chain Research, 04.

Value Chains as *"the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers, and final disposal after use."* For future understanding, we need to keep in mind the following three principals of the principles of t ***Global Value Chain Theory***:

a) The Global Value Chain (GVC) framework is arranged within a complex and interdependent nature that postulates that within the current status of economic globalisation no country can produce a good or service entirely on its own.
b) Multinational corporations have a highlighted role in terms of global production that this arranged in different stages of production across the globe according to taking advantage of not only purely cost relation differentials but also labour skills and technology.
c) Global value chains exist to increase efficiency, access to markets and reduce costs within an international organization arranged by policies that facilitate the development of international tr trade and diversification of investments.

ICT´s have allowed companies to profoundly redraws the boundaries of their firms from cloud computing to human capital. The January 2023 edition of The Economist sums up the digital implication in the process of redrawing of the firm as *"The telegraph, telephone and, in the last century, containerised shipping and better information technology (IT), have allowed multinational companies to subcontract ever more tasks to ever more places. China became the world's factory; India became its back office"*[130]. This quote also introduces us to the idea that *"China became the*

[130]See "The Fuzzy Corporation." The Economist Volume 446 Number 9329, no. JANUARY 14TH–20TH 2023, January 14, 2023.

world's factory; India became its back office." This phrase refers to the central theme of the current topic, emphasizing that trade (and subsequently geopolitics) has become highly reliant on intricate supply chains and manufacturing processes for essential components like semiconductors and microprocessors. These supply chains have effectively turned into chains of control. The Global Economy revolves around digital advances which may very well profoundly expose economies that were left behind in the technological advances, as it has to run on the current extensive and complex layout of GVC´s and face the consequent logistical challenges.

The argument above about the current paradigm of the Global Economy is mainly a follow-up based on Ronald Coase´s 1937 paper **The nature of the firm**[131] that which essence claimed the firm boundaries are determined by how transaction and information costs differ within firms and between them. According to Coase, firms exist because they are able to reduce transaction costs by having activities in-house or outsourced coordinating within the firms reducing transaction costs and achieving greater efficiency. The main purpose of the Global supply Chains is to reduce costs and increase efficiency by procuring lower costs of sourcing inputs, and manufacturing products and greater efficiency in logistics by taking advantage of the coordinating activities in the different parts of the world. The matter of why firms expanded their operations to go beyond the border[132] makes us go back to Coase´s Dilemma: *How can firms draw their boundaries?* Ronald Coase´s conclusion is that firms must balance the benefits of coordinating activities within the firm with the costs of doing so. Coase´s insights can be certainly related to the role of AI and Digital

[131] See Coase, R. H. "The Nature of the Firm." Economica 4, no. 16 (1937): 386-405. https://doi.org/10.1111/j.1468-0335.1937.tb00002.x.
[132] See "Coase's Theory of the Firm." The Economist. The Economist Newspaper. Accessed February 20, 2023. https://www.economist.com/schools-brief/2017/07/29/coases-theory-of-the-firm.

Platforms in the current Global Economy as firms use these technologies to achieve greater efficiency by coordinating the activities of the firm by also weighing the costs of doing so and reducing transactional costs such as of the sourcing inputs, manufacturing products and delivery to customers (E-commerce platforms such as Amazon use AI to optimize its supply chain, reduce shipping times, and improve customer experience).

The implications of ICT´s, AI and digital platforms help firms expand their boundaries as they can be used to help keep balance the benefits of coordinating activities within the firm with the costs of doing so, however the quest to achieve efficiency in the operations of firms contributed to reshaping of the global manufacturing landscape and the subsequent geopolitical implications of these changes[133]. Regarding the advances in digital technologies and ICT´s and relating Coase´s argument in which firm-level boundaries are determined by how transaction and information costs differ within firms and between them, firms have been using Digital platforms and AI to further streamline their processes globally as per making them more competitive in the global marketplace and allowing firms to take advantage in terms of the costs and availability of/ materials, labour and production of emerging economies. To put it bluntly, we grew accustomed to that Digital Technology and AI allow companies to redraw their borders before becoming *unwieldy*[134]. As previously described in Chapter 1, the operations of firms shifted from previously dominant countries manufacturing sector companies such as the USA to emerging economies such as India and China, who have increasingly been securing

[133] See Sturgeon, Timothy J., Jo Van Biesebroeck, and Gary Gereffi. "Value Chains, Networks and Clusters: Reframing the Global Automotive Industry." Journal of Economic Geography 8, no. 3 (2008): 297-321.
[134] See "The Fuzzy Corporation." The Economist Volume 446 Number 9329, no. JANUARY 14TH–20TH 2023, January 14, 2023

their dominance (and consequently the relations interdependence of between states and markets) on global manufacturing and augmenting their influence in economic and political influence.

Not only there is a substantial shift in the geopolitical paradigm caused by the current state of Global Value Chains, but the same countries that Western markets trust with the manufacturing processes (becoming consequently more dependent on Outsourcing, Logistics, and GVC´s) are gaining a comparative advantage in their industries, especially with the aggregated gains and unprecedented development of Digital technology and AI, and becoming a significant threat to that can present drastic changes to market wise structural sectors that we still perceive to be "unshaken" by future changes – such as "The Silicon Valley". The aforementioned observations made on the current topic serve to highlight and provide a necessary background to introduce us to some brief remarks on the globalisation process within the scope of assessing the impacts of Digital technology and AI along the Value Chain and in the competitive advantage in the manufacturing and technology sectors, which were already address In Chapter I and Chapter II of this dissertation. However, this topic secures the argument that allow us to advance to the next topic of discussion by understanding how technology and AI help establish new a progressively complex and interdependent Geopolitical layout throughout the current system of Value Chains in Global Economics. Essentially, AI and Digital technology reshaped the Global Economy, revolutionized and created new business models and arranged an interdependent and complex system of Global Value Chains by:

a) Increased Efficiency and Productivity along the Value Chain as Business models, logistics and Manufacturing processes are increasingly more efficient;

b) Improved Communication and Collaboration despite geographical barriers;

c) Greater Access to Information and the Capability to analyse large volumes of Data allows firms to have the intelligence to respond and quickly adapt to market trends;

d) Digital platforms and AI led to a cross boarder increase in connectivity between the supply and demand of firms and customers allowing Investment and Trade to grow but with further complexity and interdependence;

e) The emergence of New Technological Industries that disrupted the traditional Value Chains and made the Global Economic System more complex as it enhanced its competitive advantage in digital processes like data analysis, E-commerce, Cloud computing and "The Sharing Economy".

The discussion of a new Interdependent geopolitical layout within the current system of value chains and global economics should indeed proceeded with some remarks previous of the topic of competitive advantage to introduce the argument referring to the complex patterns of the current global economy and "AI superpower's". To understand what the competitive advantage concerns it's important to pinpoint beforehand David Ricardo's theory of comparative advantage. In his book "*On the Principles of Political Economy and Taxation*", David Ricardo presented the cornerstone of modern trade theory with his notion of comparative advantage[135] which explains why nations should focus on producing products and services where they have a lower opportunity cost and trade with other nations to reap from the benefits of trade. Even if one country is more effective than

[135] See Ricardo, David. "On the Principles of Political Economy and Taxation."

the other at manufacturing all things, Ricardo argues that both nations may still profit from trade if they focus on creating items that have a lower opportunity cost and swap them for goods made by other nations. In principle, by doing this, they may increase their consumption potential beyond their output potential and their welfare levels as he observes in the following quote *"If a foreign country can supply us with a commodity cheaper than we ourselves can make it, better buy it of them with some part of the produce of our own industry, employed in a way in which we have some advantage."*[136] Essentially Ricardo´s theory enlightens:

A) *Why do countries engage in on trade?*

B) *How can they fruitfully profit from the exchange of goods and services with other countries?*

C) *Why do countries need to account for the variables of opportunity costs and production efficiency in regard to their process of "specialization" on producing a certain type of goods and services in order to achieve greater welfare?*

As mentioned in this dissertation, AI pretty much revolutionized every step of the process since the development and production of goods, the establishment of interdependent value chain systems, the way (throughout digital platforms) in which goods and services are traded globally and many other trends that tend to disrupt the traditional patterns of trade within a shift in the comparative advantage of countries. This happens especially in the manufacturing and technological sectors where an interplay of variables such as resources, technological infrastructure and general stage of economic development together with the aggregated economic AI gains may exponentially affect

[136] Ricardo, David. "Chapter XXI - Effects of Accumulation on Profits and Interest" 289-300. Carmel, IN: Liberty Fund, 2004: 295.

the distribution of gains from trade and “specialization”. The disruptive potential of AI is consideringly changing the dynamics of trade and global macroeconomics by reshaping the competitive advantage of countries as technological development pushes countries to vigorously develop their digital infrastructures not just to maintain competitive head but to maintain them in the very competitive, fast pace and unforgiven “game” of International Trade.

3.2) AI, trade and International Macroeconomics: Comparative advantage, economies of scale and economies of scope

> *"Companies like Google and Facebook are often loath to allow local changes to their core products or business models. They tend to believe in building one thing and building it well. It's an approach that helped them rapidly sweep the globe in the early days of the internet, when most countries lagged so far behind in technology that they couldn't offer any localized alternatives. But as technical know-how has diffused around the globe, it is becoming harder to force people of all countries and cultures into a cookie-cutter mold that was often built in America for Americans. As a result, when Chinese copycats went head-to-head with their Silicon Valley forefathers, they took that American unwillingness to adapt and weaponized it. Every divergence between Chinese user preferences and a global product became an opening that local competitors could attack. They began tailoring their products and business models to local needs, and driving a wedge between Chinese internet users and Silicon Valley."*
>
> *(Kai-Fu Lee, AI Superpowers: China, Silicon Valley, and the New World Order, p.45)*

Now that we proceeded to understand the backdrop between AI, comparative advantage in international trade and how AI is being used to develop trade whilst using digital platforms and managing global value chains we must proceed, we must first understand firstly how AI is reshaping the concepts of Competitive Advantage. In short, competitive advantage is a gained availability that allows to perform over its competitors in the same industry or market through the business attributes and resources. Michael Porter defined the ***two ways*** in which an organization can gain Comparative Advantage[137]:

a) Cost advantage: When the same goods and/ or services are offered at an inferior cost.

[137] See Porter, Michael E., "Competitive Advantage". 1985, Ch. 1, pp 11-15. The Free Press. New York.

b) Differentiation advantage: When the same goods and/or services are offered with greater quality more efficiently.

In addition to the above-mentioned two outlines of a competitive advantage there is another way in which business can tackle competition and thus gain leverage over competitors as management strategy can also focus on targeting specific markets and customers according to a "segmentation strategy" that narrows down markets to smaller segments in which organizations try to attend customers' needs and desires in scope of demographic characteristics, behavioural, geographic and physical segmentation. AI increases the value of products and services by leveraging its network effects as companies seek to use technology such as AI and digital platforms to obtain Competitive advantage per cumulative participating in the constantly improving cycle where AI algorithms are effectively improved by accumulating analysing vast amounts of data -increasing the accuracy of the platforms- while simultaneously creating more applications and services that attract a greater number of users (generating more data).

Before zeroing in on matters such as the global balance of power particularly focused on *China versus USA* and how the models of public policy differentiate in terms such as public investments in AI technology and corporations and the new waves from protectionist (intended for physical and digital goods and all services, we need to firstly effectively comprehend that AI's network effects and economies of scale and scope serve as a source of competitive advantage as well as a barrier to entry, enabling to the growth of dominating digital platform corporations in the global economy[138]. Goldfarb and Trefler also state that AI's technological environment itself isn't compatible with previous models applicable to trade theory as global technology

[138] See Goldfarb, Avi, and Daniel Trefler. "AI and International Trade."

companies and digital platforms' disruptive competition for data and higher quality predictions are outgrown the theories of trade.

Theories such as Comparative Advantage and Competitive Advantage when analysing countries and firms respectively cannot simply cope within their models of prediction of the (disrupting) capability in which AI can aggregate value. Trade theories such as Comparative Advantage typically tend to indicate that better results occur within free trade and laissez-faire approaches although authors such as Krugman, who has a neo-Keynesian approach, refer that some types of government intervention are well succeeded. In order for economies to survive they must prepare themselves with better policy responses to adapt to the rapidly changing developments of AI not only for future terms but for the present premises. Prominent industry leaders of the technological sector and experts in AI such as Elon Musk and Bill Gates call for governmental action in order to allocate more financial resources towards the research and development of AI in order to cope with matters of potential economic disruption, national security and many other challenges and opportunities that urgently need to be addressed as the global balance of power is radically shifting towards China due to the development of AI capabilities in commercial and military terms (as seen in "China´s intelligent weaponry gets smarter"[139]). China's invasive trade and foreign direct investment (FDI) strategy combined with its protectionist regulations that tacitly close China to dynamic Western firms such as Amazon and Google allowed China to develop their own commercial AI capabilities evidenced by "*copycat companies*"[140] that are due to obtain household recognition outside China such as: Baidu (a search engine

[139] See Markoff , John, and Matthew Rosenberg. "China's Intelligent Weaponry Gets Smarter (Published 2017)." The New York Times. The New York Times, February 3, 2017. https://www.nytimes.com/2017/02/03/technology/artificial-intelligence-china-united-states.html. Accessed 13th of April, 2023

[140]See Lee, Kai-Fu. AI Superpowers: China, Silicon Valley, and the New World Order. Houghton Mifflin Harcourt, 2018: 47.

comparable to Google), Alibaba (an e-commerce website similar to Amazon) and Tencent (the creator of WeChat, which can be viewed as a platform that combines features of Skype, Facebook, and Apple Pay).

Instruments such as merger law and Domestic and International market competition and innovation policies work to ensuring that markets of fair and contestable but matters such as "AI capability" and big data make clear that the structural dynamics off the digital markets are within grasp of monopolistic organizations. Emily Jones corroborates the latter as she mentions *"dominant firms may lead to predatory pricing and margin squeeze strategies that drive competitors out of markets (…) They may also be used to compete downstream in anti-competitive ways, including through self-preferencing of products that they sell on the platform they operate, as in the European Commission's case against Google for self-preferencing through Google Shopping "*[141] .

Goldfarb and Trefler[142] proceeded then identify four aspects essential for our analysis in which we can assume in prior that the many economies of AI overlap some of the classic key roles in "Trade Theory"[143]:

I. Economies of scale associated with data

Essentially among all other statistical predictions, data improves according to variants such as quantity and quality. Economies of scale work through the principal that a greater number of observations (as data increases in volume and variety) will

[141] Jones, Emily. "Digital Disruption: Artificial Intelligence and International Trade Policy." Oxford Review of Economic Policy 39, no. 1 (2023): 70–84. https://doi.org/10.1093/oxrep/grac049. Accessed March 27th, 2023.
[142] See Goldfarb and Trefler, "AI and International Trade," 2018
[143] As noted almost 30 years prior to this thesis by Krugman, Paul R. "The Theory of Trade." In Peddling Prosperity: Economic Sense and Nonsense in an Age of Diminished Expectations,. W. W. Norton & Company, 43-68. 1994

generate more accurate predictions leading to providing enhancements to the decision-making process and contributing to improving productivity. This creates a positive feedback loop where economies of scale bind as to gain competitive advantage, firms must harness more data in order to make better predictions. Goldfarb and Trefler[144] mentioned the case of Google's/Alphabet´s search engine advantage as compared to Microsoft due to the substantially larger Google market share, consequently providing Google with more data which improves quality and supports users in predicting more accurately their queries.

II. Economies of Scale from the Overhead of Developing AI Capabilities

As mentioned above, more diverse and representative datasets result in obtaining superior predictability but in order to truly obtain the aggregated advantage of data firms should expand their operation in terms of developing their AI capability by investing in building a team of AI specialists. As mentioned by Goldfarb and Trefler[145] this the case of Google (Hinton), Apple (Salakhutdinov), Facebook (LeCunn), and Uber (Urtasun). By employing resources in larger teams dedicated to AI development, firms can foster higher scales of innovation which more efficient AI systems deployments and improved problem-solving skills. By vouching for a greater number of researchers, engineers and other AI experts, firms can profit from a broader range of skills knowledge, and perspectives by securing more complex projects and higher pacing on AI advancements.

III. Economies of Scope

[144] See Goldfarb and Trefler, "AI and International Trade," 2018
[145] See Goldfarb and Trefler, "AI and International Trade," 2018

Economies of Scope arise when the leverage of the capabilities and expertise of an AI research team leads to the consequent deployment of the firm´s resources and expertise in multiple applications or product. The key contributes to the fact that many of currently leading the AI forms of multiproduct firms is the sharing of data across applications in accordance with different national products policies that determine the friction/protection measures in each country. This is of course a point for future discussion as some countries such as China strategically ignore the matter of privacy policies and data sharing. The key element to understand the influence of AI in the economies of scope is that it's not necessarily driven by demand or brand recognition but by the deposit trust in innovation that will ensure additional value, knowledge, efficiency gains and cost serving as the diverse sets of applications optimize their AI research. Goldfarb and Trefler[146] mentioned the case of Alphabet which runs Google (the world's most widely used search engine), YouTube (the world's most widely used online video service), Android (the world's most widely used mobile phone operating system) is currently betting on Waymo (an autonomous vehicle division) as well as a variety of other businesses that run around promoting AI innovation as well as computational improvements.

IV. Knowledge externalities

Knowledge diffusion is the area that generates when the discussion turns into the AI sphere on the one hand, you have universities and scientific journals that provides academic, government officials, and business providing accessible ways to frontier their research according to the latest spectacular significant investments. On the other as, AI expertise on not only the filing regions globally such as Silicon Valley, Berlin,

[146] See Goldfarb and Trefler, "AI and International Trade," 2018

Shanghai, London, Tokyo, etc. as these are symbolised as the geographic regions remanent of AI innovation and where knowledge externalities originate in the AI technology, methodologies, or algorithms that will likely weigh in benefits for the wider industry. This means that we can conclude that despite technological advancements and are globally pre-and data connectors academic while we shall conclude that AI involves a lot of tacit knowledge that necessarily isn't "*easily codified and transferred to others*" as Goldfarb and Trefler[147] point out. Subsequently the latter mentioned authors that the main sources of AI expertise remain rooted in the universities and the geographic regions where those technologies were invented.

To conclude the arguments on why AI is a very different element for matters of trade and international macroeconomics, we can arrange our findings in an almost syllogistic schematic exposure:

A. Implementing AI enables platforms to utilize network effects, as the greater number of users signifies the greater the value of the platform, resulting in a virtuous loop that promotes their dominance.

B. Platforms that employ AI succeed in economies of scale and scope because AI technologies enable cost reductions and increased efficiency, as well as allowing platforms to broaden their scope by diversifying their offerings and entering new markets, capturing multiple revenue streams and driving higher profits, resulting in lower costs and higher profits.

C. Conclusion: AI's network effects and economies of scale and scope serve as a source of competitive advantage as well as a barrier to entry, leading to the growth of dominating platform corporations in the global economy.

[147] See Goldfarb and Trefler, "AI and International Trade," 2018

In order to capitalize on the latter valuable insights on the transformative nature of the economics of AI on international trade and it´s overlap with classic trade theory, stakeholders such as policy makers, business and research must always take into account the ever-changing transformative landscape and the countless new pathways AI network effects brought into business models and markets. Likewise, this understanding enables policymakers to build policies and practices that promote long-term growth, competitiveness, and equitable development. Going back to the transformative nature of the economics of AI, we can witness by the available literature a focus on the concerns towards privacy policies as a mean to restrict trade, as identified by Goldfarb and Trefler; *"So, rather than focusing trade discussions on how privacy policy might be used as a disguised restriction on trade, such discussions should emphasize regulatory harmonization so as to avoid a race to the bottom"*[148]. The emphasis of discussing the trade-off between privacy and trade should be on regulatory harmonization. In other words, the goal ought to be establish consistent and coordinated regulations across different jurisdictions so that countries do not try to attract businesses or gain a competitive advantage by implementing lax privacy regulations that provide fewer protections for individuals.

[148] See Goldfarb and Trefler, "AI and International Trade," 2018

3.3) Public policy models in China and the USA regarding AI technology, Corporations, and Protectionism: beyond China's Challenge to U.S. Global Technology Leadership

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"(...)The greater long-term threat comes from China's authoritarian Communist party-state. China has the world's fastest growing military and the most pervasive and sophisticated system of digital surveillance and control. Its pursuit of global dominance is further aided by the world's most far-reaching global propaganda machine and a variety of other mechanisms to project sharp power — power that seeks to penetrate the soft tissues of democracy and obtain their acquiescence through means that are covert, coercive, and corrupting. It is this combination of China's internal repression and its external ambition that makes China's growing global power so concerning. China is the world's largest exporter, its second largest importer, and its biggest provider of infrastructure development. It is also the first major nation to deploy a central bank digital currency; and it is challenging for the global lead in such critical technologies as AI, quantum computing, robotics, hypersonics, autonomous and electric vehicles, and advanced telecommunications."

Larry Diamond[149]

3.3.1) China´s rise and ambitions & USA´s historical dominance

The rise of China as a global power has gone hand in hand with an increased emphasis on technical advances, notably in the field of AI. The importance of the AI technology industry in shaping the power balance cannot be overstated. China understands the potential of AI to change different industries and promote economic growth, therefore increasing its worldwide influence[150]. The role of AI technology in influencing the balance of power extends beyond its economic and military

[149] Diamond, Larry. "We Have Entered a New Historical Era": Larry Diamond on the Future of Democracy."
[150] See Lee, AI Superpowers.

ramifications. Goldfarb and Trefler[151] discuss the role of AI in international commerce and its potential to influence global economic dynamics. They stipulate that AI has the ability to revolutionize trade patterns, boost productivity, and open up new possibilities for nations that embrace its potential. China's concentration on AI technology is consistent with the country's goal of becoming a worldwide leader in AI research and development. Strategic investments in AI, such as data infrastructure and people acquisition, have allowed the government to provide a solid basis for AI-powered sectors. China's state-driven approach, characterized by substantial public investments and close government-corporate collaboration, has propelled its emergence as a formidable AI player by boosting its economic competitiveness and exercising influence on the global arena by promoting AI development.

China's focus on AI technology is consistent with the country's goal of becoming a worldwide leader in AI research and development. Strategic investments in AI by the government, such as data infrastructure and talent acquisition, have helped to build a solid basis for AI-powered sectors[152]. China intends to exploit its technical breakthroughs to boost its economic competitiveness and exercise influence in the global arena by promoting AI development. These investments are seen in efforts such as the "New Generation AI Development Plan," which seeks to make China the world leader in AI innovation by 2030[153]. This framework presents a complete strategy for AI development, including research, education, industry use, and ethical concerns. The Chinese government's emphasis on AI development is visible in its funding for AI research institutions, academic-industry cooperation, and measures to attract AI talent from around the world. This strategy outlines China´s goal to be the world leader in AI

[151] See Goldfarb and Trefler, "AI and International Trade," 2018
[152] See Goldfarb and Trefler, "AI and International Trade," 2018
[153] See (People's Republic of China State Council, 2017).

by 2030 consequently monetizing to industry to obtain an expected value of 150 billion USD[154]. The rising number of AI-related patents and publications highlights the relevance of China's AI goals. According to a World Intellectual Property Organization research, China has surpassed the United States as the leading filer of AI-related patents[155]. This demonstrates the country's dedication to technical innovation as well as its progress toward being a leader in AI research and development.

The consequences of China's AI advances go beyond economic competition. China's rising AI capabilities, as a significant participant in the global arena, can affect international norms and standards in AI governance, ethics, and legislation. Goldfarb and Trefler[156] underline the need for public investments in AI research and development to create innovation and an atmosphere favourable to AI-driven economic growth. The differing patterns in public investment in AI technology between China and the United States show differences in public policy frameworks. China's approach to AI development, which combines state-led efforts within a framework of policy-first approach coordinated by a rich ecosystem of AI firms, offers an alternate model to the market-driven strategy used by the United States. The United States, on the other hand, has historically been at the forefront of technical innovation and AI research. However, it is being challenged by China's tremendous growth in AI research and applications. The United States government has made attempts to retain its technical superiority by focusing on private sector initiatives and supporting innovation through a combination of public investments and market forces[157]. The geopolitical component of AI

[154] See Roberts, Huw, Josh Cowls, Jessica Morley, Mariarosaria Taddeo, Vincent Wang, and Luciano Floridi. "The Chinese Approach to Artificial Intelligence: An Analysis of Policy, Ethics, and Regulation." AI & Society 36 (2021). doi:10.1007/s00146-020-00992-2. Accessed May 20, 2023
[155] World Intellectual Property Organization. "World Intellectual Property Report 2019: The Geography of Innovation – Local Hotspots, Global Networks." 2019. https://www.wipo.int/edocs/pubdocs/en/wipo_pub_941_2019.pdf
[156] See Goldfarb and Trefler, "AI and International Trade," 2018
[157] Goldfarb and Trefler, "AI and International Trade," 2018

development adds a competitive aspect to the Sino-American relationship considering the United States has traditionally been at the forefront of technology innovation and AI development. As both countries strive to maintain their technological leadership and secure their economic and national security interests, public models will increasingly portray a definitive share in dictating successful approaches by affecting how AI technologies are developed, implemented, and regulated in each country.

China´s rapid economic growth has been enjoying some of the world's highest rates for almost three decades, obtaining a reputation of as "economic miracle". To factor in China's rapid economic growth, we must therefore consider in prior three important factors:

1. China's demographic dividend allows for a large workforce as its population has low levels of dependency and contributes to the Chinese economy by fostering high levels of savings and a high level of national and foreign investment.
2. China's conscious shift from a predominantly agricultural economy to being the biggest manufacturing country in the world reflected several of the country´s structural changes and how it opened itself to the world by opening up markets.
3. China's populational roads are slowing down as by 2012 China's labour force growth dropped to around zero and Chinese Policy makers recognized China's necessity to maintain high rates of growth without the labour force increase, so an alternative model stimulated by further technological innovation was required[158].

[158] See Naughton, Barry & Tsai, Kellee Sing (eds.) (2015). "State Capitalism, Institutional Adaptation and the Chinese Miracle". Cambridge University Press.

To put the argument on China's political and economic landscape in the context of broader discussions is necessary to understand that a potential slowdown in economic growth could somehow undermine the implicit social contract that somehow results from the trade-off combination of China's internal repression of political freedoms for global dominance in Geopolitics. This argument is supported by countless commentators such as Christopher Balding who highlights the importance for China to maintain high levels of growth due to the implicit trading by citizens of political freedoms for economic growth and *embourgeoisement*[159]. The argument is also sustained as researchers highlight Chinese society´s support for the party and a relatively lacklustre desire for democracy as they are satisfyingly driven by the provided promise of economic perspective and improved standards of living. This argument is practically popular within China's emergent middle class that implicitly believes in sacrificing their political freedoms, such as democratic participation, for the sake of maintaining the existent system (which implicitly relies on social stability and support for the ruling regime) that provides them the promised economic growth and social advancement[160]. Jie Chen goes on stating *"The chief political implication of this study is that China's middle class is unlikely to serve as a catalyst of democracy, either immediately or in the very near future"*[161] as the Chinese middle class will continue to show significant less support for participatory norms as long as this One-Party-State ensures the material well-being of the new middle class. As the crucial role of the Chinese state in economic growth is considerably more evident, the developing middle

[159] See explore the arguments in Balding, Christopher. "What's Causing China's Economic Slowdown." Foreign Affairs, March 11, 2019. Accessed May 20, 2023. https://www.foreignaffairs.com/articles/china/2019-03-11/whats-causing-chinas-economic-slowdown.
[160] See Chen, Jie. A Middle Class Without Democracy: Economic Growth and the Prospects for Democratization in China. Oxford University Press, 2013
[161] Chen, Jies (2013) page 163

class will be more reliant on the authoritarian system that gave rise to it and less willing to oppose current rulers.

So, we can deduct that in order for the Chinese government maintain its stability (and some of the inherent features of the Chinese political system such as corruption[162]) must ensure economic growth and consequently maintain the well-being of middle classes. To maintain this, China must endure its focus on pursuing the potential economic benefits of AI as it is central to the country's overall economic development[163]. In addition to this, sources such as the 2017 PwC report suggest that China is the country that is the most to gain from AI as it estimates a boost in the GDP up to 26% by 2030[164]. So, to effectively aggregate gains brought by the improvements in AI and automation, China is providing substantially higher rates in the installation of robotic upgrades corresponding to more than double the number of robotic installations in China as in Europe. As ***The AI Index 2018 Annual Report*** calculated an average amount of 500% increase in the annual installation of robotic upgrades since 2012 in China as a response to the growing rate of just over 100% in Europe[165]. The ***World Robotics 2022 – Industrial Robots – report*** asserted by The International Federation of Robotics (IFR) claimed that: *"78% of global robot installations in five countries. The five major markets for industrial robots are China, Japan, the United States, the Republic of Korea, and Germany. These countries accounted for 78% of global robot installations. China has been the world's largest industrial robot market since 2013 and*

[162]See Diamond, Larry. 2003. "The Rule of Law as Transition to Democracy in China." Journal of Contemporary China 12 (35): 319-331. https://doi.org/10.1080/1067056022000054632.
[163] See Kania, Elsa B. "China's Embrace of AI: Enthusiasm and Challenges." ECFR.eu, October 26, 2021. https://ecfr.eu/article/commentary_chinas_embrace_of_ai_enthusiasm_and_challenges/. Accessed June 27, 2023
[164] PwC, "Sizing the Prize."
[165] See Shoham, Y., Perrault, R., Brynjolfsson, E., Clark, J., Manyika, K., Niebles, J. C., Lyons, T., Etchemendy, J., Grosz, B., Bauer, Z. 2018. "The AI Index 2018 Annual Report." AI Index Steering Committee, Human-Centered AI Initiative.

accounted for 52% of total installations in 2021. (…) The United States accounted for 7% of robot installations in 2021. The United States leapfrogged the Republic of Korea into third place with a record installation count of 40,373 units in 2018 and has since maintained this position."[166]. The above mentioned 2022 IFR report also concluded that the largest market for robots is the electrical/electronics industry[167] overpassing since the year 2020 the automotive industry.

The general perception of robots in China has always been positive, in contrast to the negative sentiments towards robots in many countries as they may replace jobs. Matching to China's industrial policy in other sectors (such as the electric vehicle and solar power industries), subsidies are the most common form of government support, luring companies into sectors that would otherwise be ignored[168]. China attributes its local level governments with the accountability to manage investment funds and allocated funds to backing automation, robotics adoption and other general innovation policies. As with other types of policy in China, there is a fair bit of regional variation regarding policies that support the adoption of robotics technology, driven by factors such as differences in fiscal capacity, regional industrial infrastructure, and the priorities of local leaders[169]. For example, in 2015, the Guangdong provincial government established a US$150 billion (USD) fund to encourage enterprises to invest in automation technology and promote robotics innovation[170].

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[166] Müller, Christopher. "World Robotics 2022 – Industrial Robots." IFR Statistical Department, VDMA Services GmbH, Frankfurt am Main, Germany, 2022. Accessed June 28, 2023

[167] Designated in the report as "the production of household appliances, electrical machinery, semiconductors, solar panels, computers, telecommunication devices, and video and electronic entertainment goods".

[168] See Cheng, Hong, Ruixue Jia, Dandan Li, and Hongbin Li. "The Rise of Robots in China." SSRN, July 9, 2019. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3415648. Accessed June 30, 2023

[169] Hong Cheng et al., "The Rise of Robots in China," SSRN, July 9, 2019, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3415648, 12

[170] See Yang, Zi. "Who Will Satisfy China's Thirst for Industrial Robots?" The Diplomat, May 20, 2017. https://thediplomat.com/2017/05/who-will-satisfy-chinas-thirst-for-industrial-robots/. Accessed 30th of June 2023

Government documents promoting the introduction and production of robots make little mention of the threat of job displacement. Instead of worrying about job replacement, the government is emphasizing the introduction of robots as a way to tackle the employment challenge[171]. One reason the Chinese see robotics (and automation) as a positive phenomenon is that many believe that technological progress is essential to China's rise as a world power. This perception stems, in part, from China's painful early encounters with the West. Since the Opium Wars of the 1840s, China has experienced a number of foreign invasions, many of which stem from China's technological inferiority. The following discussion on the importance of technology in the 2016 State Council National Plan is instructive as found by Cheng et al (2019):

"One important reason why China fell into backwardness and took beatings in the modern era is that the previous industrial revolutions slipped through our fingers, leaving us with weak technology and a weak state. To realize the great rejuvenation of the Chinese nationhood that is the Chinese Dream, we must make genuine use of science and technology, this revolutionary force and lever of power in the highest sense."[172]

Asian countries are leaders in the field of manufacture of electronic products and components having China as its front-runner. Nevertheless, during the Covid-19 epidemic, demand for consumer electronics increased, and electronic components are critical components in all types of engineering, including automotive and industrial gear. The restricted manufacturing capacity and supply chain interruptions caused by the pandemic have highlighted the need for broadened production capacity in the

[171] See Yang, Yuan, and Xinning Liu. "China's AI Push Raises Fears over Widespread Job Cuts." Financial Times, August 30, 2018. https://www.ft.com/content/1e2db400-ac2d-11e8-94bd-cba20d67390c. Accessed 30th of June 2023

[172] Hong Cheng et al., "The Rise of Robots in China," SSRN, July 9, 2019

electronics industry. As worldwide supply lines were interrupted by the epidemic, several semiconductor providers and electronic equipment producers were forced to temporarily halt production. Because of blocked borders and other constraints, upstream products (inputs) were unavailable, and outputs could not be distributed. With the aggregated demand for consumer and industrial electronics experienced in the Covid-19 lockdown, it became apparent that China is much more reliant on imparting technologies such as semiconductors from other countries such as Taiwan and extended far away from achieving technological self-sufficiency[173]. This exposed China to be more vulnerable to the disruption and global supply chains than previously perceived as China faced logistical challenges, closure and overall reduced production capacities leading to furthering the felt geopolitical tensions.

However, the exposure of reduces production capabilities was not only shown by the failure of global supply chains but by factors that illustrate the lack of human labour that congregated a scenario of an aging population and declining workforce. China is now dealing with the consequences of an aging population and a shrinking workforce[174]. From the late 1970s to 2015, the introduction of the one-child policy, together with advances in healthcare and greater life expectancy, resulted in a considerable decrease in the number of people of working age, as it has led to a higher proportion of elderly individuals who are no longer active participants in the labour market. As a result, China faces a diminishing labour pool, posing considerable problems for businesses that rely significantly on human labour, notably industrial and

[173] See Hong Cheng et al., "The Rise of Robots in China," SSRN, July 9, 2019
[174] See Cheng, Hong and Jia, Ruixue and Li, Dandan and Li, Hongbin, The Rise of Robots in China (June 1, 2019). Journal of Economic Perspectives, Volume 33, Number 2, Spring 2019, Pages 71–88 , 21st Century China Center Research Paper No. 2019-02 , Available at SSRN: https://ssrn.com/abstract=3415648 Accessed on 28th of June 2023

low-skilled service sectors. This demographic transition has resulted in fewer people available to enter the work market and support economic development.

China successfully establishes its place as the world's factory due to the combination of a large pool of several hundred millions workers and cheap labour, but at a current, stance it´s battling demographic challenges that reflect a shrinking population[175] and rapidly increasing labour costs. Announced in 2015, Made in China 2025 (MIC 2025) is a multi-decade that prompts to become the strongest manufacturing nation on Earth while focusing on shifting its entire chain of supply chain from labour intensive tasks (as neighbouring nations are offering larger pools of cheap labour) to the medium-high end of the global value chain with advanced "smart" manufacturing clusters. China´s main premise for medium to long-term growth seems to focus on the argument that China's national prosperity cannot exist without strong manufacturing. Ultimately, the latter also enforces the need that China has to procure automation not primarily to necessarily avoid labour and manufacturing costs but to increase its production capacities in order to secure the current market and keep up with future projections in demand within distinctive spheres of dominance currently secured, as China is the global leader in terms of internal manufacturing in the Automotive[176] and Electronics industries. To put it bluntly, Automation and Robots may only be China's feasible response to fight the aging population and the consequent pending issues that it imposes on labour, production capacity and productivity needs while concurrently attending to other needs for technological advancements to the effects of current demographic trends on the country's economic development as concluded by Harvard International Review: *"As China*

[175] See How severe are China's demographic challenges? ChinaPower Project. 2023, March 15. https://chinapower.csis.org/china-demographics-challenges/ Accessed on the 28th of June 2022
[176] See International Organization of Motor Vehicle Manufacturers (OICA). (2021). Production Statistics 2020. Retrieved from http://www.oica.net/category/production-statistics/2020-statistics/ Accessed on the 28th of June 2022

transitions to a service- and consumption-driven economy and begins to de-emphasize its traditional economic core of manufacturing, the government is betting big on automation to offset the population decline and aging crisis it is experiencing today. The rise of the industrial robot and the chatbot shows us that no job is safe, but this new reality may be a saving grace for China even as it presents a threat in the United States and Western Europe.

The data tells us that, where countries weather the storm of aging and low fertility, they typically have automation to thank. China appears to recognize this potential and may be headed in the right direction in safeguarding the economy against stagnation."[177]

While China's strategy is substantially centralized and state-driven, the US has a decentralized approach that emphasizes the importance of the private sector and market forces in generating economic development and innovation. Recognizing AI's enormous potential, the US government is aggressively fostering collaboration between academics, businesses, and startups to promote technical developments in this sector. Indeed, via programs such as the National Artificial Intelligence Study and Development Strategic Plan, the government has made major strides to support the study, development, and implementation of AI technology across multiple industries. The National Science and Technology Council presented this comprehensive strategy in 2016 as a blueprint for the progress of AI in the country. By promoting AI, the United States seeks to preserve its position as a worldwide leader in technological innovation, actively recognizing the enormous influence this technology may have on a wide range of businesses. However, the United States is up against significant competition in this industry, most notably from China. As, in recent years, China has made considerable advances in AI research and

[177] Meacham, Sam. "Beijing Welcomes Its New Robot Coworkers: China's Aging Crisis and Automation." Harvard International Review, March 31, 2023. https://hir.harvard.edu/beijing-welcomes-its-new-robot-coworkers-chinas-aging-crisis-and-automation/. Accessed July 4, 2023

development, and the United States is well aware of the necessity to stay ahead in this fast-expanding terrain[178]. Instead of actively procuring automation by deploying improvements in industrial robots to a higher extent, such as China, The United States hopes to speed the development and deployment of AI technology in businesses such as healthcare, finance, transportation, and others by utilizing the knowledge and resources of these many sectors.

Most recently, the Covid-19 pandemic, which began in the Chinese manufacturing hub of Wuhan, has highlighted the vulnerability of the United States to global value chains, leading to calls for "re-shoring" of US capabilities. Essentially, the Covid-19 pandemic exposed the fragility of Global value chains and it further the supported recent deglobalisation trends by rethinking the benefits and costs associated with offshoring manufacturing and technology[179], as noted in Pres. Joe Biden´s administration's approach to the People's Republic of China *"We see that in how Beijing has perfected mass surveillance within China and exported that technology to more than 80 countries; how its advancing unlawful maritime claims in the South China Sea, undermining peace and security, freedom of navigation, and commerce; how it's circumventing or breaking trade rules, harming workers and companies in the United States but also around the world; and how it purports to champion sovereignty and territorial integrity while standing with governments that brazenly violate them."*[180] The

[178] See Atkinson , Robert; D., and Ian Clay. "Wake up, America: China Is Overtaking the United States in Innovation Capacity." ITIF.org, January 23, 2023. https://itif.org/publications/2023/01/23/wake-up-america-china-is-overtaking-the-united-states-in-innovation-capacity/. Accessed July 5, 2023

[179] See Belton, Keith; B., Jonh ; D. Graham, and Suri Xia. "'Made in China 2025' and the Limitations of US Trade Policy." SSRN, September 11, 2020. https://policyinstitute.iu.edu/doc/mpi/made-in-china-2020.pdf.: 05. Accessed 29th of June 2023

[180] "The Administration's Approach to the People's Republic of China." State.Org. United States Government, May 26, 2022. Office of the Spokesperson. https://www.state.gov/the-administrations-approach-to-the-peoples-republic-of-china/. Accessed 5th of July 2023

fact is that either Republican or Democratic candidates based their campaign since 2016 om China as they commonly know that:

i) China is a serious economic threat to US interests.
ii) China intends to flout its obligations under international trade law with illegal trade activities.[181]
iii) The consequential shift of the manufacturing capacities outsourced production capabilities of key essential industries, such as the case of semiconductors, and the consequential need for reshoring and diversifying the same manufacturing capacities from China.

While certain politicians' discourse on supply chains may occasionally veer towards protectionist tendencies, it is important to acknowledge the valid concerns surrounding the risks and vulnerabilities that have emerged because of extensive globalisation. Current US president Joe Biden's Administration and the European Union Trade Commission[182] are arranging strategies in order to diversify supply chains and supress vulnerabilities and "supply autonomy" to bring back the production of critical goods back home. This new competitive paradigm is often point out as a zero-sum game in the "US versus China AI race". To see it as a race to the bottom, it simply promotes industry interests as the lobbying for anti-competition legislation (allowing big tech companies such as Amazon, Google, Apple and Facebook to grow more) and the

[181] Donald Trump, while in campaign, went as far to use the term trade "rape". See Gass, Nick. "Trump: 'We Can't Continue to Allow China to Rape Our Country.'" POLITICO, February 5, 2016. https://www.politico.com/blogs/2016-gop-primary-live-updates-and-results/2016/05/trump-china-rape-america-222689. Accessed 5th of July 2023

[182] See Commissioner Phil Hogan. "Introductory Statement by Commissioner Phil Hogan at Informal Meeting of EU Trade Ministers." European Commission. April 16, 2020. https://ec.europa.eu/commission/commissioners/2019-2024/hogan/announcements/introductory-statement-commissioner-phil-hogan-informal-meeting-eu-trade-ministers_en. Accessed June 10, 2023.

enforcement of data privacy laws that could potentially hinder the competitiveness of US companies as this sort of regulatory vacuum grants competitive lead for China[183].

Grantly, the "US vs China AI Race" ultimately implies a rationale that promotes the proliferation of policy instruments and government economic support for the development of the AI industry and certain strategic technologies such as semiconductors[184]. Essentially this imposes The United States of America with a dilemma that revolves around compromising their known lack of state-level economic intervention to adopt Industrial policy (a polarizing term for US Politics as its associated with centralized economies) to support certain sectors of the economy in order to consequently support the National Interest[185] [186]. To conclusively grasp the prior discussion, the argument must account for the next topic of discussion that conclusively assembles a response regarding addressing how these tensions led to affecting overall the flow of goods and the strategies for rethinking global supply chains.

3.3.2) Strategies and challenges to reshoring industry and diversification from China: Rethinking Global Supply Chains or Deglobalisation?

Current policy responses frequently rely on the United States' narrative of a zero-sum battle in which either the United States or China will triumph[187]. The characteristics of this race mimic the Cold War-era armaments and space competitions, emphasizing AI's geopolitical relevance. However, this technological race happens in a

[183] Lomas, Natasha. "Zuckerberg Urges Privacy Carve Outs to Compete with China." TechCrunch, April 10, 2018.https://techcrunch.com/2018/04/10/zuckerberg-urges-privacy-carve-outs-to-compete-with-china. Accessed July 01, 2023
[184] See Mathis, Joel. "The CHIPS Act and Industrial Policy, Explained." The Week, August 2, 2022. https:/theweek.com/economy/1015566/the-chips-act-and-industrial-policy-explained. Accessed July 01, 2023
[185] See Leonhardt, David. "An Investment with a Big Return." New York Times, June 8, 2021. https://www.nytimes.com/2021/06/08/briefing/investment-senate-china-bill.html. Accessed July 01, 2023
[186] See Lincicome, Scott. "Conservative Industrial Policy and the 'China Threat'." Cato Institute (blog), August 28, 2020.. https://www.cato.org/blog/conservative-industrial-policy-china-threat. Accessed July 01, 2023
[187] Goldfarb, Avi, and Daniel Trefler. "AI and International Trade."

very different time-space, and it carries a varied range of different technological, economic and geopolitical transformative changes. First, we must ask: To frame this narrative as a race to the bottom is the correct foundation for investigating the effects of AI and developing policies?

a) First to frame the future of economic and technological development into the outcome of the AI race between both countries simply oversimplifies the complex nature of AI and its potential benefits. It forgoes the fact that AI is a transformative technology that needs multilateral engagement and international collaboration to promote sustainable development and mitigate negative impacts while developing balanced AI policies that promote innovation[188]. This rhetoric is used to lobby for big tech companies to lower standards for privacy laws and to broaden government economic support for tech companies.
b) Secondly to perceive this as a zero-sum game frame is to set this as a competition where there is a winner and a loser Between two countries. This ignores the fact that AI is an informative technology that has global implications that consequently broadens the limits of a competition between two countries by becoming a global phenomenon with different applications for different sectors, economies, societies, etc. and humanity as a whole.
c) Thirdly, to perceive AI development in the latter frame it involves forgoing long-term sustainability and ethical considerations, where countries are drawn to achieve low governance standards in order to achieve triumph. This foregoes cooperative approaches such as

[188] World Intellectual Property Organization, "The Geography of Innovation."

international cooperation and collaboration not only and technological development and knowledge spillovers but also in establishing cooperative dialogue such as in order to establish common norms (such as the data privacy regulation), standards, and other types of policies and legislative framework. This endures in that a multilateral approach towards this technological race not only fosters inclusive and accountable deployment and development of AI technologies but it strengthens the needs capacities in order to address the challenges and opportunities presented by AI.

Furthermore, prominent experts such as Bill Gates, Stephen Hawking, and Elon Musk will likely continue to encourage governments to loosen their wallets[189], in order to tackle the Chinese threat and the vulnerabilities of global supply chains by diversifying it and bringing part of the production of critical goods back home. This also contributes to highlighting the shift from a defensive stance adopted by countries such as the United States (with clear influence and other political actors such as the EU Japan and Korea) towards an offensive strategy to compete with China in the race for AI's privacy. The topic of China's pursuit of AI supremacy was already discussed for the purpose of this discussion with yet to name some concise reasons that could certainly supply the key trends for China to triumph and the AI race and potentiate the vulnerabilities of other economies. However, a current summary revaluation of China’s Prowess in the AI race needs to be considered beforehand:

I. China's efforts in research and development are highly regarded internationally as China is home to nine of the top 10 AI institutions. “China's

[189] Goldfarb, Avi, and Daniel Trefler. “AI and International Trade.”

ambition goes beyond domestic development. It aims to export its regulatory standards and AI applications globally, shaping international norms and standards in AI governance."[190]

II. China possesses a vast amount of data with a significant advantage as compared with the USA and many other Western states due to adding more sources of data (such as virtual assistants, robots and social surveillance systems like the social credit system) and until recent times a fairly permissive approach to data governance that currently is being drawn in to exert greater control over information flows since the government has implemented a system of virtual censorship known as "The Great Firewall of China". This of course occurs within China's goals and balancing privacy/national security/economic interests within its current leadership integration of technology in everyday aspects of life. Some of the legislative requirements are simple, such as requiring sensitive data to be managed in accordance with China's larger data governance policy. Other provisions might be fairly onerous. The January 2023 restrictions, for example, require providers to "dispel rumours" circulated by utilizing content created by their products, which means that corporations are liable if their AI tools provide facts or opinions that contradict the Chinese Communist Party position[191].

III. China is implementing AI standards and regulations in order to shape international engagement to aggregate influence on global norms regarding

[190] Roberts, Christopher, Luke Scher, Gabrielle Schwartz, William C. Hannas, and Christopher K. Cooke. 2021. "China's Ambitions in Artificial Intelligence: Domestic and Foreign Policy Dimensions." In Handbook of Global Technology Policy, edited by Robert P. Looney, 147-164. World Scientific Publishing.

[191] See Toner, Helen, Jenny Xiao, and Jeffrey Ding. "The Illusion of China's AI Prowess." Foreign Affairs, June 26, 2023. https://www.foreignaffairs.com/china/illusion-chinas-ai-prowess-regulation?check_logged_in=1&utm_medium=promo_email&utm_source=lo_flows&utm_campaign=registered_user_welcome&utm_term=email_1&utm_content=20230706. Accessed on July 7, 2023

the collection, storage, processing, and transmission of data. China seeks to evolve the global discourse on AI ethics and regulation. Efforts such as the personal information protection law (PIPAL) place China's data policy closer to the EU´s legislative matter[192] (such as the General Data Protection Regulation)[193] to prepare for compliance with cross border data transfers and security. However, to have the Chinese significantly influencing international AI norms and regulations seems unlikely due to the intrusion on individual privacy and other overthrown civil liberties by China as June the 2023 *Foreign Affairs* article puts it: *"Given the wide range of censored opinions and subjects in China—from the health of the Chinese economy to the progress of the war in Ukraine to the definition of "democracy"—developers will struggle to make chatbots that do not cross redlines while still being able to answer most questions normally and effectively."*[194]

Currently, as of the year 2023 we are witnessing Chinese economic coercion that contributes towards the progress of policy goals. According to a recent 2023 Centre for a New American Security (CNAS) analysis[195] on Chinese economic coercion, the effects are not necessarily strategic or tactically beneficial, but they focus on pursuing goals such as bolstering domestic nationalistic support, obtaining competitive advantage in the manufacture of semiconductors (in which China is far from achieving autonomy) and

[192] See Herbert Smith Freehills. "China cybersecurity and data protection: Review of 2020 and outlook for 2021." London: Herbert Smith Freehills, 2021. Accessed July 7, 2023. https://www.herbertsmithfreehills.com/latest-thinking/china-cybersecurity-and-data-protection-review-of-2020-and-outlook-for-2021.

[193] See European Commission. "The General Data Protection Regulation - Consilium." consilium.europa.eu, 2022. https://www.consilium.europa.eu/en/policies/data-protection/data-protection-regulation/. Last reviewed on September 1, 2022

[194] Toner, Helen, Jenny Xiao, and Jeffrey Ding. "The Illusion of China's AI Prowess." Foreign Affairs, June 26, 2023. https://www.foreignaffairs.com/china/illusion-chinas-ai-prowess-regulation. Accessed on July 7, 2023

[195] See Kendall-Taylor, Andrea and Nicholas Lokker. "Russia-China Defense Cooperation." Center for a New American Security (en-US), April 27, 2023. https://www.cnas.org/publications/reports/russia-china-relations. Accessed on July 7, 2023

development of AI. The war in Ukraine contributed to major Western economies and allies to proceed with intense Russian economic sanctions, that parallelly potentiate strengthen the Sino-Russian economic and military Corporation as both countries share their perceptions of the United States as their most significant security challenge and is a declining power. China's is interested on increasing Russia's military readiness as an allied to hasten a shift towards a more multipolar world where they commonly gain more influence. It´s also worth citing CSIS report that sums up the complementary strategy in which both countries pursue their geopolitical interests: *"(…) For Beijing, the primary benefits have been the acquisition of more sophisticated military capabilities and enhanced operational readiness from joint exercises with the more experienced Russian forces. Moscow, for its part, has seen a significant influx of capital from both China's purchases of weapons systems and its investments in Russian defense projects. Cooperation in developing capabilities such as AI, guided missiles, and unmanned vehicles has allowed each country to progress faster than it would on its own."*[196]

The outgoing effects of Russia's invasion of Ukraine and the chain gridlock during Covid-19 19 pandemic makes economic security issues highly visible to consumers and voters but only in EU countries and the United States but also in Japan and South Korea. As these countries face different problems and degrees of interdependence from China, different strategies are being drawn upon "a new sense of urgency for leaders to reduce vulnerability and increase government and private firms' capacities to deftly crisis"[197]. In May 2021 ex-Google CEO Eric Schmidt, in a final report of the National Security Commission on AI, spoke in regards of the acute threat to US citizens from China's

[196] Kendall-Taylor, Andrea, and Nicholas Lokker. "Russia-China Defense Cooperation." Center for a New American Security, April 27, 2023. https://www.cnas.org/publications/reports/russia-china-relations. Accessed on July 7, 2023

[197] Yeow, Andrew, and Kristin Vekasi. "Can the United States, South Korea, and Japan Boost Resilience to Economic Coercion?" Brookings.edu, May 17, 2023. https://www.brookings.edu/articles/can-the-united-states-south-korea-and-japan-boost-resilience-to-economic-coercion/. Accessed on July 7, 2023

advances in AI. This propelled the USA under Pres. Joe Biden's administration to catch up with China's growing influence by promoting strategies of trade and industrial policies that favours their own industry and by banning the use of Chinese equipment's such as networking devices and security cameras that can propel the Chinese to data collection and consequently to spy on the activities of the American government and government officials. Furthermore, in August 2022, the Biden-Harris administration passed an exports ban on other than US sourced chips named the "Chips and Science Act", hindering China's access to the open market technological advances of Western companies and using it for its own research and development.

The legislation not only restricts foreign semiconductor makers[198] from selling particular chips to China or from providing Chinese enterprises with the technologies needed to build them, but additionally it also encourages them to invest in facilities in the United States by granting subsidies. The Act would allow winners to receive $280 billion in funding as long as they do not develop equivalent facilities in China. The endowment is designed to boost US semiconductor capacity, spur R&D, and establish regional high-tech centres as well as a larger, more diverse STEM workforce. At first glance, the mentioned legislation appears to have elements of economic nationalism and protectionism, as it aims to protect domestic semiconductor industries and potentially limit China's access to advanced technologies, while granting subsidies to semiconductor manufacturers to invest in facilities in the United States. Ultimately, this falls far from being protectionism as the USA aims towards a peer competition strategy in which they and like-minded partners form a path for Collective resilience from China´s Economic

[198] Such as respectively the two largest Chip manufacturers: Taiwan Semiconductor Manufacturing Company and Samsung. See Sohn, Jiyoung, and Asa Fitch. "WSJ News Exclusive | Samsung, TSMC Win Exemption from New U.S. Chip Restrictions on China." The Wall Street Journal, October 13, 2022. https://www.wsj.com/articles/samsung-gets-one-year-exemption-from-new-u-s-chip-restrictions-on-china-11665639994. Accessed July 10 2023

Coercion. The United States has drawn networks of "re-shoring" and "friend-shoring"[199] with like-minded partners, relocating important portions of the industrial chain away of China or locations where China has undue influence. This way, the supply chain is brought back to the United States and/or to trustworthy partner economies[200].

The above-mentioned initiative can be characterized by the "Chip 4" alliance that ties the U.S., Japan, South Korea and Taiwan to consolidate the semiconductor supply chain against China´s predatory practices. In his congressional testimony, Vitor Cha, Senior VP for the Asia and Korea Chair and Vice Dean of Georgetown University regards these efforts to deserve merit as it promotes ultimately diversification, but they lack greater adhesion. The above-mentioned author proposes the adhesion from other countries that seek to preserve the liberal order from China's economic coercion, such as the mentioned G7 countries plus Australia, in order to gain greater collective strength to carry out "unison punishment if and when China Acts Against any of these states in collective"[201].

Similarly, it is imperative to discuss some of the challenges that the implementation of a friend-shoring policy would face, as well as to briefly evaluate one of the key institutional developments associated with this new approach to economic cooperation, namely the United States-EU Trade and Technology Council (TTC), which held its fourth ministerial meeting in May 2023. The TTC has already been dubbed "the new 'friend-shoring' vehicle." While the TTC is definitely attempting to integrate US-EU regulatory policy in several key areas, its limits are no less indicative of the barriers to greater

[199] See Kessler, Sarah. "What Is 'Friendshoring'?" The New York Times, November 18, 2022. https://www.nytimes.com/2022/11/18/business/friendshoring-jargon-business.html. Accessed July 10, 2023

[200] See Cha, Victor. "Examining China's Coercive Economic Tactics: Congressional Testimony by Victor Cha." CSIS, May 10, 2023. https://www.csis.org/analysis/examining-chinas-coercive-economic-tactics. Accessed July 07, 2023

[201] See Cha, Victor. "Examining China's Coercive Economic Tactics: Congressional Testimony by Victor Cha." CSIS, May 10, 2023. https://www.csis.org/analysis/examining-chinas-coercive-economic-tactics. Accessed July 07, 2023.

cooperative involvement, given there are considerable disparities in themes such as regulatory philosophy[202]. During the Trump presidency, the European Union was confronted with high tariffs and significant uncertainty regarding the future direction of US trade policy. Unfortunately, the Biden administration's determination to pursue a robust industrial policy at home, with billions of dollars in subsidies so that the US can "build back better," has sparked European ire and resentment[203], as the European Union remains hesitant to become "collateral damage" in the US' attempt to degrade China's military capabilities and is considering the development of its own comparable tool. Despite differences in key policy areas, the TTC could serve as a model for cooperation, avoiding potential "splinterization" of the digital economy and transatlantic technology ecosystem in favour of multilateralization of standards and policies that firmly establish transatlantic leadership in the twenty-first century. Working toward long-term and legally enforceable agreements will improve the possibility that this diplomatic framework will be implemented over time. Emily Benson and Ethan B. Kapstein conclude their remarks on this transatlantic economic relation with the following statement: *"For now, however, transatlantic leaders must demonstrate their ability to effectuate tangible outcomes if friend-shoring is to go beyond mere policy rhetoric. In that context, it would be useful for them to recall that this has been a long-term objective of the Western alliance. As the 1949 North Atlantic Treaty notes: "The Parties . . . will seek to eliminate conflict in their international economic policies and will encourage economic collaboration between any or all of them.""*[204]

[202] See Benson, Emily, and Ethan B. Kapstein. "The Limits of 'Friend-Shoring.'" CSIS, February 1, 2023. https://www.csis.org/analysis/limits-friend-shoring. Accessed July 10, 2023
[203] See Scott, Mark, Barbara Moens, and Doug Palmer. "Bitter Friends: Inside the Summit Aiming to Heal EU-US Trade Rift." POLITICO, December 5, 2022. https://www.politico.eu/article/trade-tech-council-china-subsidies-ira-joe-biden-emmanuel-macron-summit-ttc/. Accessed July 10, 2023
[204] Benson, Emily, and Ethan B. Kapstein. "The Limits of 'Friend-Shoring.'" CSIS, February 1, 2023. https://www.csis.org/analysis/limits-friend-shoring. Accessed July 10, 2023

The pending question is: Are we really rethinking global supply chains or Deglobalizing? Although current supply chains were developed over decades and rewiring them will be difficult, as they are the outcome of individual decisions and government, the government needs to prioritize which industries are most critical to national security and prosperity. Recent COVID-19 disruptions, and economic sanctions for Russia and China's "trade wars" highlight the risks and vulnerabilities of current complex supply chains and to tackle it government needs to intervene by mediating broader public interest with individual private interests according to each nation priorities. Ultimately this is a matter that will generate much discussion as it involves a trade-off between national prosperity/security and the efficiency of current business models that currently depend on the complexity of value chains.

If Governments around the world want to rewrite value chains, they must ally in partnerships with private firms and anticipate possible failures in the supply network by running stress tests and war games[205]. After gaining knowledge about this matter it becomes easy to discard the labels of "protectionism" and "deglobalisation" as countries intend to increase their autonomy and not incur in strategies for self-sufficiency as it would be geopolitical and economic suicide Furthermore, current government interventions seem to be strengthening international coordination as allies are coordinating and sharing a common effort to restructure GVC's from learning from each other's experiences and potentially prepare them to avoid unforeseen shocks and inefficiencies. While enduring times of cholera and uncertainty during the Covid-19 Pandemics, Geoffrey Gertz fellow at Brookings Institute and Director for International Economics at USA´s National Security Council, acknowledges some remarks that will

[205] See Simchi-Levi, David, and Edith Simchi-Levi. "We Need a Stress Test for Critical Supply Chains." Harvard Business Review, February 1, 2021. https://hbr.org/2020/04/we-need-a-stress-test-for-critical-supply-chains. Accessed July 10, 2023

simultaneously be used to conclude this topic :*"Much of the recent political rhetoric around supply chain vulnerability has either implicitly or explicitly assumed that sourcing inputs from foreign suppliers—and particularly Chinese suppliers—is risky, while domestic sourcing would be safer and more stable. But the truth is more complicated:*

A diversified network of foreign suppliers may be more resilient and better able to respond to shocks than a concentrated network of domestic suppliers, for instance.

And the risk of relying heavily on Chinese suppliers will not only vary by product and industry but also depend on the course of future geopolitical relations, which may be difficult to predict."

The above citation reflects the pending way of uncertainty toward redrafting Global Value chains, furthermore this is deepened in cases of industries that take care of the supply of items such as semiconductors supply chains or cloud computing. Companies in general are less willing to adjust their business strategies or make costly new investments in risk management than initially what governments expected. Consequently, these companies face high costs as their manufacturing process is highly demanding on GVC and companies are hesitant to divert resources from innovation and market expansion to focus on supply chain adjustments. According to the European Chamber of Commerce in China, only roughly 11% of its members are considering relocating outside of China; similarly, the President of AmCham China pointed out that the bulk of the group's members do not want to leave China[206]. When analysing the case of Intel´s current

[206] See McDonald, Joe. "Companies prodded to rely less on China, but few respond." Associated Press News, June 29, 2020. https://apnews.com/bc9f37e67745c046563234d1d2e3fe01. Accessed July 11, 2023 And "Supply Chain Challenges for US Companies in China." AmCham China. April 17, 2020. https://www.amchamchina.org/press/supply-chain-challenges-for-us-companies-in-china/. Accessed July 11, 2023

state of failure when tackling reshoring and competing with the Asians, although the US Congress appears favourably disposed to provide subsidies for domestic chip production[207], I stumble upon the remarks of Rush Doshi about the Intel and Semiconductor industry case: *"Onshoring chip manufacturing, in other words, is about more than the provision of capital – it requires a larger supporting ecosystem that can create that resilience. That kind of ecosystem will not be built overnight, it will in part have to be created with patience, and in some cases with better immigration policies, some careful experimentation with incentivizing localization, subsidies and credits where appropriate, and several other instruments."*[208]

The above remarks are allegoric towards the challenge imposed with restructuring GVC´s, after all the markets never sleep! And in this unending pursuit of profit, we recognized the vulnerability that dependence brings while uncertainties loomed, disrupting the flow of goods and exposing the fragility of our reliance. Ultimately, capital does not buy self-reliance and strategic vision, nor does it take care of reshoring an entire ecosystem overnight. In conclusion, by creating an enabling environment that supports reshoring initiatives, Western economies and allies can attract investment, stimulate job creation, and foster sustainable economic growth. To successfully conquer this quest countries must act swiftly and decisively. Utopia is a romanticized notion of a flawless or ideal world that may or may not be totally attainable in reality. While seeking improvements and resolving current difficulties, redrafting GVCs should be considered an ongoing process with continuing adaptation and modifications rather than a set terminus. Finally, whether redrafting GVCs constitutes a utopia depends on one's

[207] See Brown, Sara. "Intel CEO: Let's Turn the Rust Belt into the 'Silicon Heartland.'" MIT Sloan, April 25, 2023. https://mitsloan.mit.edu/ideas-made-to-matter/intel-ceo-lets-turn-rust-belt-silicon-heartland. Accessed July 11, 2023

[208] Doshi, Rush. "The United States, China, and the Contest for the Fourth Industrial Revolution."

perspective, the exact aims and outcomes desired, and an assessment of the feasibility and desirability of the proposed revisions. When contemplating redrafting GVCs, states may have set the bar too high, since it would take careful planning in trade-off management between performance, sustainability, and resilience to produce value for the customer. Certainly, in this regard expecting a swift change with low difficulty challenges is Utopia. Nevertheless, in a world of ever-changing complex dynamics, the challenges are real, but so are the possibilities. But again, we cannot expect "Rome to be built in a day".

3.4) Retrospection and Progressive Analysis III

The impact of AI on global trade is profound. AI transcends borders, operating within a global digital ecosystem spanning industries. Digital platforms are central to this ecosystem, enabling real-time data exchange across geographies. This integration affects Global Value Chains (GVCs), reshaping production and supply chains. AI's disruptive nature challenges traditional trade theories.

Geopolitically, the competition for AI dominance, particularly between China and the United States, is reshaping global power dynamics. China's substantial investments in AI and state-led approach pose an alternative to the US's market-driven model.

China's demographic challenges are driving automation, while the US emphasises private sector-led innovation. COVID-19 exposed supply chain vulnerabilities, leading both nations to diversify supply chains.

In summary, AI's impact on trade is complex. China's rise in AI is significant, but the narrative should go beyond a simple US-China competition. AI's global implications require international collaboration for responsible development and governance. Cooperation and multilateral engagement are essential to navigate the transformative landscape of AI in global trade.

Conclusion

It's irrefutable that AI has a profound impact in the global economy as the nature of AI technologies such machine learning, deep learning and automation are increasingly transforming industries and reshaping businesses while aggregating economic growth. I stand with no doubt that AI can be considered as disruptive as other technologies such as electricity, as the real disruptive worth of AI is yet to be discovered. A future systemic use of AI will not only bring the benefits of decoupling prediction from the rest of decision-making processes, while vastly contributing to productivity and efficiency, but it will significantly rewrite how new systems and processes are deployed, developed and designed in an economy that is progressively more digital and consequently more dependent on being powered by AI. Currently we are "between times" as although we see AI as a transformational technology, we have yet to establish its full potential increase on the systemic uses in a way that could significantly change the world as we know it in 2023. In conclusion, this dissertation has examined various aspects related to the intersection of algorithms, AI, digital surveillance, and their impact on the global economy. Throughout the research, several key findings and insights have emerged.

Lastly, it's important to assert one last time that goal of this dissertation is not to answer issues that may arise future conjecture whilst on a present time frame, but rather to prepare policymakers and the general public for discussion on major decisions that are about to be made and will demand their (democratic) engagement. Overall, this dissertation underscores the complex and multifaceted nature of technological progress in the world economy. It emphasizes the importance of understanding the implications of AI, digital surveillance, and global economic dynamics. To navigate these transformations effectively, policymakers, businesses, and societies must consider the

potential impacts on productivity, inequality, jobs, and the balance between innovation and ethics. By addressing these challenges and opportunities, we can strive for a more inclusive, equitable, and sustainable future in the age of AI and digitalization.

1.How modern AI works and how it can be applied in order to impact Productivity and the subsequent impact on Jobs, Wages and Inequality?

Considering facts, conclusions and the intrigues raised in regarding in the discussion of this chapter, I had come up with logical scheme to arrange facts and conclusions that I had considered:

a) As Labour productivity (GDP per worked hour) is down in the Western world despite the high rate on ongoing digitalization and other transformation technologies, reports from reputable firms (McKinsey, PWC, Deloitte, etc…) advertise massive productivity gains and changes in the amount of labour utilization as for the early birds by the automation and augmentation of (once) Human tasks.

b) As the reports potentiate the gains of automation and augmentation on human task and production, consequently the same reports point out massive gains in GDP and ultimately a high rate of jobs that can be victims of substitution. So, the real concern recalled in this chapter arises: Is it likely that Humans become obsolete? While figures and facts from diverse sources might contribute to a puzzling future predicament, technological diffusion tends to be slower than reports from “the big firms” say and the current trend of substitution and consequently it´s cost to benefits ratio point out that the substitution of the majority of human jobs is not feasible for present times. In addition, technology tends to constantly enhance in a medium long-term Job creation. Even if it´s assumed that there is no fixed number of jobs, researchers mention prudent to be

apprehensive about the short-medium disruptive transition where the markets mechanisms (invisible hand) fail.

c) It´s crucial to prepare for this "transitional moments" as they carry painful and even catastrophic consequences especially for Western lower skills workers as significant number of tasks plausibly are becoming obsolete (such as the case of truckers) and consequently will require a rewiring of our educational systems in order to accommodate this transitional and combat unemployment by upskilling and reskilling. The latter also potentiates a outcome where greater inequality and less social mobility arises and where greater state intervention might be needed to accommodate the ones who are at downfall with this transition such as a Stimulus and or Universal Basic Income (UBI).

Granting that there is likely a false alarmism regarding technological disruption in particular regard of AI technologies and that empirical evidence might suggest that the pace of technological development is declining, automation and augmentation will significantly impact the nature and tasks of human jobs but likely in a slower diffusion rate than what the hype suggest. Even so, nations must contemplate the dangers of Technological feudalism (where wages are down and unemployment is up) to maintain social order whilst allowing human existence to steer away from property and disengagement. We also must fight climate change in order to safeguard human existence while crafting policies to guarantee that human beings will still pursue meaningful challenges while, in the absence of a traditional job (in singularity as Ray Kurzweil defined) will affect a part of society. Consecutively the latter implies securing human dignity and prospering by investing in education and cultivating intrinsic human values, as this focuses on the struggle for social and environmental sustainability in future times.

2. *How does the economy turned data driven and data began to be capitalized by all sectors of the economy?*

Data has undeniably assumed a central role in the fabric of modern capitalism, permeating all sectors of the economy. Rather than treating data as a mere commodity, some contemporary thinkers view it as a dimension of capital itself. This shift in perspective sets the stage for our chapter's primary objective: to empirically highlight how digitalization and AI are giving rise to a novel business model. The drive on this new business model, is particularly dependent on AI to leverage rapid, efficient, and superhuman-level data analysis. It is essential to recognize that "big data" has effectively become the custodian of our digital footprints, encompassing our social data, search engine activities, online purchases, and more. The new business models are predicated on the relentless exploitation of this continuous DataStream, effectively capitalizing on various aspects of human life with minimal constraints. As the year 2022, our world begun to grapple with an array of formidable challenges, from the relentless COVID-19 pandemic and severe financial hardships to inflationary pressures and geopolitical tensions exemplified by the invasion of Ukraine. These adversities have led to substantial price hikes in essential commodities like fuel, wheat, and corn, with inflation outpacing wage growth and causing a decline in citizens' purchasing power. This period stands in stark contrast to the economic prosperity of the 1990s, with the 2020s proving to be a challenging and disillusioning era marked by global protests addressing climate change, corruption, racism, and economic inequality (such as the Yellow vests protests).

These developments underscore the profound societal transformations underway. The failures let-downs of neoliberalism, such as income inequality, outsourcing, and wealth

concentration among elites, have profoundly influenced the economic landscape, leading to rising unemployment and austerity measures. Shoshana Zuboff's analysis, echoing Thomas Piketty, highlights *how the return rate of capital (r) consistently exceeds economic growth (g)*, exacerbating income inequality and allowing financial elites to influence political decisions. This has given rise to a what Zuboff´s recalls as neo-feudal state where wealth, rather than personal merit, determines life prospects. However, most of these arguments are refuted by Jonah Goldberg perspective in his book "The Suicide of the West." Although Goldberg, does not specifically delve in the topics of technology and surveillance capitalism he dismisses these critiques as he denies the notion that elites function as "puppeteers" orchestrating societal disarray and fuelling populism. Jonah Goldberg contests the idea that the super-rich can effectively rig democracy in their favour as he highlights the dynamic political battles among liberal and conservative billionaires. Goldberg delves into the prevalence of tribalism, which he sees as a divisive force that appeals to our innate desire for comparative advantage. Jonah Goldberg proposes a return to fundamental conservative values, emphasizing limited government, natural rights, traditional values, and individual liberty as the core principles of a new conservatism. This approach aims to preserve the pluralism of institutions and the importance of civil society within the framework of the liberal order against the "isms" that widespread distrust in the liberal establishments.

Zygmunt Bauman's observation about the gap between self-assertion and control in our times resonates, particularly as digitalization erodes privacy in the pursuit of commercial profit. The emergence of "third modernity" raises questions about human obsolescence, the pursuit of a meaningful life, and the role of data-driven capitalism, while Big Tech monopolies challenge free-market logic and usher and resemblance in some respects in tone of surveillance capitalism. Joseph E. Stiglitz's critique of "creative

destruction" highlights how persistent monopoly profits in today's markets, driven by companies like Amazon, Google, Tesla, and Microsoft, challenge the theory's assumptions. The COVID-19 pandemic accelerated digitalization, intensifying online interactions and surveillance capitalism. As we contemplate the future, we must grapple with the implications of data-driven capitalism, the erosion of privacy, and the shifting power dynamics between citizens and tech giants, demanding unwavering attention in navigating the complexities of the digital age.

Before delving into the global economy's current dependence on data, it is imperative to briefly examine the transformative effects ushered in by the digital economy. The phrase "Data is the new Oil" has become a ubiquitous metaphor for understanding the economic landscape of contemporary digitalization. However, it is crucial to discern that data differs significantly from oil. Unlike oil, data is not a finite resource; instead, it is subject to temporal constraints influenced by both the predictive value of data and evolving public policies regarding privacy. This distinction forms the basis for understanding the unique dynamics at play in the data-driven era.

3. *How does digitalization, the new geographies of production and the quest for AI supremacy is changing international macroeconomics?*

In the context of AI's impact on global trade, it is crucial to underscore the seamless international collaboration and integration of AI technologies. AI transcends national borders, operating within a global digital ecosystem that spans industries from logistics to gig economy platforms and consumer products. This highlights the necessity of ensuring fairness, accountability, and security in cross-border AI operations.

Digital platforms, integral to this global AI ecosystem, play a central role in enabling real-time data exchange and communication across geographies. These platforms are closely intertwined with Global Value Chains (GVCs) and Global Production Networks, facilitating real-time interfirm relations, technological transfer, and enhancing firm-level capabilities. GVCs, as defined by Kaplinsky and Morris, encompass all activities required to bring a product from conception to final disposal, emphasizing the interdependence of countries in production. This transformation is a result of the interplay between AI, digital platforms, and GVCs. They have allowed companies to redraw their operational boundaries, making them more efficient and competitive globally. However, this shift in the global manufacturing landscape has geopolitical implications, as supply chains have evolved into chains of control, impacting not only the economy but also the balance of

In essence, the global economy, driven by AI and digital technology, has become more complex, interdependent, and competitive. It has reshaped comparative advantage, posing both challenges and opportunities for nations in the digital age. Understanding these dynamics is crucial for policymakers, businesses, and researchers as they navigate the transformative landscape of international trade and geopolitics. AI is transforming the traditional concept of competitive advantage. While cost and differentiation advantages remain crucial, AI introduces a new dimension: data-driven customization and personalization at scale. AI enables companies to gain a competitive edge by harnessing data and algorithms to offer highly tailored products and services. This transformation is closely tied to the conceptual economies of scale and scope. AI-driven firms benefit from large datasets, leading to more accurate predictions and efficiency improvements. Moreover, AI allows platforms to diversify their offerings and enter new markets, capturing multiple revenue streams and reducing costs. However, AI's influence challenges conventional trade theories like Comparative Advantage and Competitive

Advantage. These models struggle to account for the value AI brings through data-driven innovation, requiring policymakers and researchers to adapt their frameworks. Geopolitically, the competition for AI dominance, notably between China and the United States, is reshaping global power dynamics. China's advancements in AI, coupled with protectionist regulations, have allowed domestic tech companies to challenge Silicon Valley. Privacy policies became crucial specially for the matters of the commerce and technological trade. Rather than restricting trade, discussions should focus on regulatory harmonization to protect privacy rights while facilitating international trade. Adapting to this changing landscape is essential as the global balance of power shifts in the AI era.

China's rise as a global power is marked by a significant focus on advancing AI. Recognizing AI's potential to reshape industries and boost economic growth, China has made substantial investments in AI research and development. The Chinese government's "New Generation AI Development Plan" outlines a comprehensive strategy aimed at making China the world leader in AI by 2030, with an expected market value of $150 billion USD. These investments are reflected in the increasing number of AI-related patents, surpassing the United States, and publications. China's AI advances extend beyond economic competition; they have the potential to influence international norms and standards in AI governance, ethics, and legislation. China's approach combines state-led efforts, policy-driven initiatives, and strong collaboration between the government and AI firms, presenting an alternative model to the market-driven approach favoured by the United States. This competition in AI development is integral to the broader Sino-American relationship, affecting how AI technologies are developed, implemented, and regulated.

China's rapid economic growth, driven by factors like its demographic dividend and shift from agriculture to manufacturing, has earned it the label of an "economic miracle."

However, the country now faces demographic challenges, with an aging population and shrinking workforce. To maintain growth and address these issues, China is turning to automation and robotics. These technologies are seen as crucial not only for economic competitiveness but also for mitigating the impacts of demographic trends. In contrast, the United States has historically emphasized private sector-led innovation and market forces in driving AI development. While it acknowledges AI's potential, the U.S. government promotes collaboration between academia, businesses, and startups to foster technical advancements.

The COVID-19 pandemic exposed vulnerabilities in global supply chains and prompted discussions about reshoring capabilities. China's reliance on global supply chains, particularly for critical components like semiconductors, became evident. Both the United States and China are now considering strategies to diversify their supply chains and enhance resilience. In summary, both nations are pursuing distinct approaches to AI development, with China's state-led model contrasting with the U.S.'s market-driven approach. This competition carries implications not only for economic growth but also for geopolitical influence. Additionally, demographic challenges and the need to secure critical supply chains add complexity to the evolving relationship between these global powers. The strategies and challenges related to reshoring industries and diversifying from China present a complex landscape that defies a simplistic zero-sum narrative. While it's tempting to frame this as a race between the United States and China, such an approach oversimplifies the multifaceted nature of AI and its potential benefits. AI is a transformative technology that requires international collaboration to ensure sustainable development and responsible policies. Viewing it as a zero-sum game between two countries ignores the global implications of AI, which has applications across various sectors and societies, transcending national borders. Furthermore, framing AI

development as a purely competitive endeavour risks sacrificing long-term sustainability and ethical considerations. Cooperation, multilateral engagement, and collaborative dialogues are essential for establishing common norms, standards, and legislative frameworks that govern AI. Such an approach not only promotes inclusive and accountable AI development but also enhances global capacities to address the challenges and opportunities presented by AI. The rise of China in the AI race is indeed noteworthy.

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