PERSPECTIVES

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WINTER EDITION FOCUS:

AUTOMATION, AI, & THE ECONOMY

VOLUME II

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The entire editorial team would like to thank the Education Committee of KBS for their support in funding *Perspectives*, as this will ensure that the journal will have the resources needed to help support budding academics across King's Business School.

The team would also like to recognise the incredible support from the academic faculty. In particular, we would like to express our heartfelt gratitude to Vice Dean of Education Sally Everett for her commitment to supporting the journal, and for her steadfast belief in its stated purpose. We would like to thank Prof. Mary O'Mahony, as *Perspectives* is rooted in the economics department at KBS, for her contributions towards the original essay competition and for her support in turning the journal from an idea into a reality.

Finally, we would like to thank Dr. Canh Thien Dang for all his efforts as the first advocate for a KBS student journal. He provided tireless support in building up this first edition, and it is no exaggeration to say that without him, *Perspectives* would not exist.

PROFESSOR FOREWORD

We are excited to welcome you to the second edition of the King's Business School Undergraduate Research Journal, marking another successful milestone in our journey. This edition reflects the growing enthusiasm for research within our community, with even more students participating. We are especially proud of this issue's timely theme—AI and the economy—exploring one of the most pressing topics in today's world.

We extend our deepest gratitude to the new editorial team, whose dedication and hard work have shaped this edition. Their efforts, both in refining the journal and organizing engaging social events, have brought students together in a shared commitment to academic excellence. A special thanks goes to the contributors and winners of the essay competition for sharing their insightful thoughts and participating in this exciting activity. Your voices and perspectives have enriched this edition and inspired meaningful discussions.

As we celebrate this achievement, we are already looking forward to the next edition and a new round of our essay competition, which we hope will become a cherished tradition at King's Business School. Thank you to all who contributed, and we eagerly anticipate what's to come!

Dr. Canh Thien Dang
Lecturer in Economics, King's Business School

EDITORS' FOREWORD

Welcome to *Perspectives*, King's Business School's first undergraduate research journal. It is our pleasure to present this second edition, exploring the transformative theme of Automation and AI. Here, we showcase the top submissions from the King's Business School Essay Competition 2024 — thought-provoking works that tackle the intricate impacts of AI on business, economy, and society.

Artificial intelligence is reshaping our world at a speed few could have imagined. Its applications span sectors and redefine the skills, jobs, and value creation processes at the heart of modern economies. From advancements in natural language processing to breakthrough automation in financial services and manufacturing, AI's reach has far surpassed initial expectations, fundamentally transforming how we live and work. This edition delves into these dynamics, featuring research that examines both the promises and challenges of an increasingly AI-driven world.

Our commitment to fostering intellectual growth in the King's community extends beyond the pages of this journal. In the academic year 2023/24, *Perspectives* hosted three engaging events featuring esteemed speakers who offered insights into real-world research and economic policy. We welcomed Dr. Filipa Sa, former economist at the Bank of England and MIT PhD graduate, who presented her research on immigration economics, sparking discussions on how data-driven policies shape communities and labor markets. Dr. Alec Fraser, a manager within the NHS and an expert in health economics, shared his insights

into healthcare management and the economic structures supporting public health — a field where data, policy, and compassion converge in unique ways. These events were designed to deepen students' understanding of research-driven roles and the broad societal impacts they enable.

To build an academic haven within the King's community, Perspectives is bridging the gap between theoretical knowledge and research application, especially for students who may feel less connected to career-focused societies. Recently, we organized the Perspectives Open House, a guided introduction to our team and an interactive session on quantitative research methods for students new to academic research. This initiative aligns with our goal of making Perspectives a close-knit and supportive environment where students can build research skills in a community dedicated to learning.

We hope this issue will inspire curiosity, spark debate, and encourage a thoughtful exploration of automation and AI's role in our shared future. Thank you for joining us on this journey.

Nicole Lim Re Gin and Tanisha Sawa
Perspectives Co-Editors in Chief

TECHNOLOGY SECTION

INTRODUCTION

"The ever-accelerating progress of technology ... gives the appearance of approaching some essential singularity in the history of the race beyond which human affairs, as we know them, could not continue.

– *John von Neumann*

At the end of 19th century, the emergence of the steam engine catalyzed the First Industrial Revolution, significantly boosting production efficiency. In the first half of the 20th century, automation technologies such as assembly line and robotics further increased productivity and reduced costs. The global adoption of such technologies led to ever advanced levels of industrialization, consequently, provided robust support for sustained economic growth.

Entering the 21st century, the development and application of artificial intelligence (AI) and automation have brought even more profound changes to the economy. So, what role does AI play in the economy? Some say data-driven artificial intelligence should be regarded as a new factor of production; some define it as a new form of automation; some contend that it can be understood as an integral component of the market discovery process. While it is challenging to assert which perspective is most accurate, one certainty remains: the integration of AI into the economy is expected to bring transformations. These changes will not be limited to the production of goods and services; they will also extend to market operations, economic value creation and resource distribution. The

ongoing research of the topic highlights the potential of AI and emphasizes the need for consideration of AI's implications.

The featured essay delves into Singapore's digital competitiveness during and post COVID-19. It examines drivers of digital adoption in Singapore related to health and the economy and investigates obstacles in Singapore's digital evolution. Additionally, the essay discusses the economic benefits distribution of adopting technological solutions among SMEs in Singapore. Singapore, as a unique nation and society, is considered one of the most advanced and open in the world. Frequently regarded as a trailblazer in the adoption of new technologies. It has the potential to serve as a global model for the integration of government, AI and the economy.

The Technology Section invites readers to discuss "the essential singularity" that we are living in right now and share ideas on how AI should be integrated in society and the economy.

Zidong Zhang & Jonathan Ouyang
Perspectives Technology Section Editors

To What Degree Did COVID-19 Hinder Singapore's Digital Competitiveness? Investigating obstacles and advantages brought forth by the pandemic

Nicole Lim Re Gin

Introduction

Digital competitiveness is the capacity of an economy to adopt and implement digital technologies, thereby transforming business models, society and government practices (Bris et al., 2017). The paper starts by offering a brief rundown of the commonly recognised economic and health channels in which the pandemic has driven Singapore towards digitalization, adding on to current literature that emphasizes a "digital surge" triggered by COVID-19 (Ahuja, 2022; Dé et al., 2020). Next, it adopts a unique perspective by focusing on COVID-19 induced factors which may have hindered Singapore's digital competitiveness, including a decline in talent inflow, reluctance to digitalize among small and medium-sized enterprises (SMEs), and skepticism towards technological solutions. Through deeper assessment of the impact and relevance of these underexplored factors in the backdrop of the Singaporean community, the essay raises the question of whether they possess ample importance to offset the rapid pace of digital transformation in Singapore.

The decision to focus on Singapore stems from its exemplary status as a developed nation adept at navigating digital transformation amid a global crisis. Singapore's consistent priority in innovating advanced technological infrastructures (EDB Singapore, 2023) renders it an intriguing case study for examining changes to digital competitiveness during the pandemic. The country's uniquely law-abiding populace, compact and open nature, and strategic government initiatives provide valuable insights into the mechanisms through which digitalisation can be expedited, even under adverse conditions. This focus

enables a nuanced analysis of the interplay between a nation's specific attributes and its digital resilience.

Pivoting in the Pandemic: Drivers of Digital Adoption in Singapore Related to Health and the Economy

Recognizing that machinery is not susceptible to viruses, the necessity of digital transformation became apparent for an effective response to the COVID-19 healthcare crisis. Giving precedence to automation over human labor emerged as the most successful approach in controlling the virus, minimising human contact, and improving the effectiveness of contact tracing endeavors. Consequently, the Singaporean government increased Information and Communication Technology (ICT) spending significantly by 30% during the peak of the pandemic in fiscal year 2020, with a portion dedicated to developing new technological solutions for COVID-19 mitigation (GovTech Singapore, 2020). Notably, Singapore led the way by launching the TraceTogether mobile contact tracing app, which utilises Bluetooth signals to record encounters between nearby smartphones (Burgess, 2020). This additional data from TraceTogether substantially reduced the time needed for contact tracing (Chee, 2021), thereby improving the effectiveness of isolating close contacts. Despite the obstacles presented by the swiftly changing pandemic circumstances, the app development timeline was greatly accelerated, reaching completion within a mere 8 weeks (Choudhury, 2020). Government policies, such as mandating the use of TraceTogether and providing physical tokens for individuals without mobile phones (Qing, 2021), substantially increased its usage by May 2021, where 92% of Singaporeans above the age of 6 were utilising the platform (Baharudin, 2021). The healthcare crisis prompted rapid government innovation and encouraged citizen acceptance to digital solutions, inadvertently enhancing Singapore's digital competitiveness in the process.

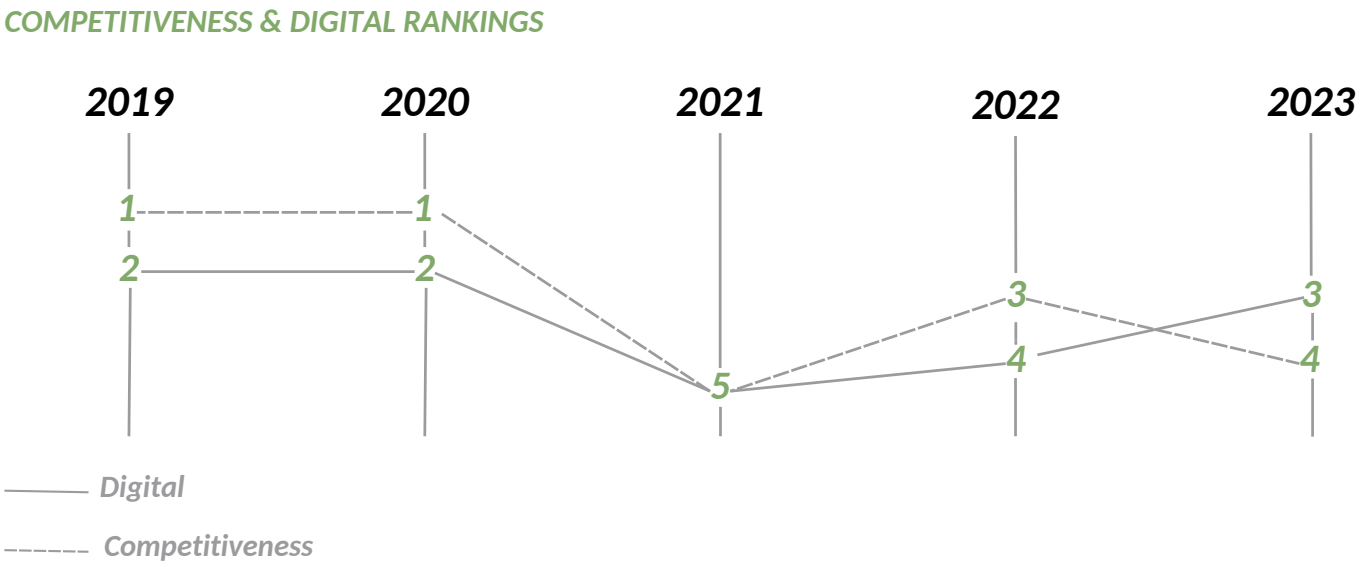
Moreover, COVID-19 presented companies with a compelling economic incentive to enhance their digital competitiveness. Shortages in manpower, exacerbated by social distancing mandates and lockdowns, compelled firms to increase capital-

intensiveness in order to resume production (Bardhan et al., 2022). This shift towards manpower-light production methods may persist beyond the pandemic, aiming to increase productivity and mitigate potential future disruptions (AlphaBeta, 2021). Furthermore, the significant layoffs in the economic downturn of the pandemic led to decreased expenses in retraining employees to use new systems, thereby rendering the rapid shift to automation the most economical approach (Ding and Molina, 2020). This trend, known as "automation forcing," is evident in the significant number of Singaporean businesses (84%) that reported accelerated efforts in their digital transformation, thereby reducing their implementation schedules by two years on average (Singapore Business Federation, 2020). Overall, Singapore stands to gain an economic windfall of SGD65.3 billion by 2030 through the full utilisation of digital technologies, with a substantial 66% of this potential stemming from technologies that assist businesses in navigating the economic challenges brought about by COVID-19 (Access Partnership, 2023). Consequently, the financial crisis induced by the pandemic has created substantial economic incentives for Singaporean businesses, which can be realised through the acceleration of their digital competitiveness.

Past the Surge: Investigating Obstacles in Singapore's Digital Evolution Amid the Challenges of the Pandemic

Despite the clear evidence of accelerated digital progress in Singapore, a closer examination reveals potential hindrances to this advancement, particularly regarding talent acquisition during the COVID-19 pandemic. Digital sector jobs, being predominantly knowledge-based, require a sizeable highly-skilled workforce (Tan, 2021), a need that Singapore can only partially meet because of its limited population size. Additionally, Singapore's dual identity as a country and a city presents challenges in attracting more high-skilled labour compared to other global cities with hinterlands (Zalizan, 2022). Therefore, ensuring a consistent influx of foreign talent into Singapore is crucial for sustained growth in digital competitiveness, which was hindered by cross-border travel restrictions

during the pandemic. These restrictions persisted longer in Singapore compared to Western countries, with border controls lifted only in February 2023 (Kok, 2023), a year after the United Kingdom (GOV.UK, 2022). Moreover, the pandemic triggered the most entrenched economic downturn throughout Singapore's short history (Harui, 2020), leading to increased unemployment and a rise in xenophobic sentiments among certain segments of society who view foreigners as competing for local jobs (Wong, 2020). As a result, the government increased the minimum salary requirement to obtain an employment pass (EP) in 2020 and intensified monitoring of companies showing preference for expatriates over locals in hiring practices (MOM Singapore, 2020). Consequently, Singapore's digital competitiveness dropped significantly from 2nd to 5th place in IMD's World Digital Competitiveness Rankings between 2020 and 2021 (Fig 1), marking the most notable decline thus far (IMD, 2023).



N.B. *This graph provides only a comparison of the country's performance in the two rankings.*

Fig 1: IMD World Digital Competitiveness Rankings across the Years (IMD, 2023)

Upon closer examination of the components contributing to the ranking in recent years (Future Readiness, Technology, Knowledge), we note that Singapore's ranking drops significantly in the category of 'Immigration Laws' under 'Technology'. Singapore experienced a noticeable decline in this specific category, falling from rank 48th in 2020 (Fig 2) to rank 61st in 2021 (Fig 3).

TECHNOLOGY

Subfactors	2016	2017	2018	2019	2020
Regulatory framework	2	1	2	2	1
Capital	10	14	8	8	11
Technological framework	1	1	1	1	1

Regulatory framework	Rank
Starting a business	3
▶ Enforcing contracts	1
▷ Immigration laws	48
Development & application of tech.	2
Scientific research legislation	2
Intellectual property rights	5

Capital	Rank
IT & media stock market capitalization	26
Funding for technological development	3
Banking and financial services	3
▶ Country credit rating	1
Venture capital	7
▷ Investment in Telecommunications	41

Technological framework	Rank
Communications technology	8
▶ Mobile Broadband subscribers	1
Wireless broadband	7
Internet users	1
▶ Internet bandwidth speed	1
High-tech exports (%)	4

Fig 2: Techology Sub-components in 2020 (IMD, 2020)

TECHNOLOGY

Subfactors	2017	2018	2019	2020	2021
Regulatory framework	1	2	2	1	5
Capital	14	8	8	11	14
Technological framework	1	1	1	1	2

Regulatory framework	Rank
Starting a business	3
▶ Enforcing contracts	1
▷ Immigration laws	61
▶ Development & application of tech.	1
Scientific research legislation	8
Intellectual property rights	8

Capital	Rank
IT & media stock market capitalization	31
Funding for technological development	4
Banking and financial services	4
▶ Country credit rating	1
Venture capital	10
▷ Investment in Telecommunications	55

Technological framework	Rank
Communications technology	10
Mobile Broadband subscribers	20
Wireless broadband	8
Internet users	24
▶ Internet bandwidth speed	1
High-tech exports (%)	3

Fig 3: Techology Sub-components in 2021 (IMD, 2021)

Indeed, the results support the assessment that the rise of protectionist immigration legislations during the pandemic hindered Singapore's economic digitalisation. However, this hindrance was temporary and diminished as Singapore's economy recovered. As COVID-19 supply bottlenecks ease over time, Singapore's inherent limitations as a small country compel the government to resume actively attracting foreign talent (Elangovan, 2022). This change becomes apparent starting from 2022, as Singapore's digital competitiveness ranking shows a gradual improvement subsequent to the easing of immigration regulations (Fig 1).

Although the COVID-19 pandemic instigated the use of technology for healthcare responses, citizen skepticism towards technological alternatives also became more commonplace. Given the pandemic's unprecedented speed, it required immediate government action, leading to policy implementations that underwent less scrutiny than usual (Han, 2021). One significant incident was the public uproar in response to the Singaporean government's utilisation of TraceTogether data for a police murder case, despite previously assuring the public that the app would solely be dedicated for contact tracing (Elangovan and Tan, 2021). This revelation heightened concerns about privacy breaches and the government's utilisation of surveillance. Given that citizen acceptance and utilisation of such technologies are pivotal for enhancing a nation's digital competitiveness (Bris et al., 2017), a violation of confidence from the public could impede the adoption of technologies supported by the government in future, thereby slowing Singapore's digital transformation. Nevertheless, this obstacle may not significantly deter digital receptivity, considering the deeper Singaporean context. Firstly, Singapore's long-standing one-party rule since independence suggests a high level of government loyalty among its citizens, contributing to a gradual normalisation of state surveillance despite lingering privacy concerns (Freedom House, 2020; Lee and Lee, 2020). Secondly, the Asian Singaporean culture emphasizes obedience to authorities and adherence to policies (Chien, 2016), as evidenced by the widespread participation in TraceTogether, positioning Singapore as a leader in adoption among nations wi-

-th similar tracking applications like Hong Kong and Israel (Lee and Lee, 2020).

Moreover, the economic benefits of adopting technological solutions induced by the pandemic are not evenly distributed among businesses. SMEs with restricted resources and limited economies of scale have lowered motivation to undergo digitalisation, as automation tends to offer the most benefits to larger businesses involved in mass-producing standardized items. When the lockdowns legislated business closures, many SMEs were forced to divert attention from committing to digitalization, giving precedence to breaking even within the business first (Baharudin, 2020). Evidently, the majority of local SMEs (54%) encountered difficulties in maintaining digital transformation efforts since the pandemic, according to a study of 400 SMEs in Singapore (ASME and Microsoft, 2020). Digital competitiveness in Singapore could slow down if this continues, considering that SMEs account for nearly half of Singapore's economy and make up approximately two out of every three jobs (Tan, 2023). Nevertheless, this trend is likely to be alleviated through the government's continued promotion for SMEs to digitalise during COVID-19. For instance, the government increased budgetary support for the Productivity Solutions Grant (PSG) and Enterprise Development Grant (EDG), intended to provide financial support for implementing digital alternatives in SMEs. This was done at the height of COVID-19 in 2020, even when budget constraints were a major concern (Wong, 2022). With these initiatives, the possibility of the pandemic setting back long-term digitalisation in SMEs is reduced.

Conclusion

In summary, despite prevailing notions and evidence suggesting a pandemic-driven 'digital surge', this paper comprehensively examines the challenges posed by COVID-19 on digital transformation. While pandemic-related barriers did noticeably hinder Singapore's digital competitiveness, Singapore has also shown significant recovery and enhanced digital readiness in the years following. We highlight the three unique facets of the Singapore community that played a quintessential role in reducing the magnitude of the barriers: a largely law-abidi-

-ng populace, its open and small nature, and carefully devised government strategies. Overall, this underscores the necessity of analyzing the impact of COVID-19 on digitalisation within the context of each country's specific circumstances.

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ECONOMICS SECTION INTRODUCTION

The accelerating pace of technological innovation and adoption places us at a critical juncture for both economic theory and policy making. As advanced technologies, particularly artificial intelligence (AI), permeate various sectors, they raise fundamental questions about the distribution of economic gains, the future of work, and the resilience of labor markets. In an era where productivity gains are increasingly driven by automation, economists are called upon to reevaluate the foundational principles of growth and, more urgently, the underpinnings of employment. In this edition of Perspectives, the Economics Section addresses the pressing issue of employment in the context of AI and automation, situating itself within the broader discourse in today's economic landscape.

Recent empirical studies present a nuanced view of technology's impact on the labor market, challenging the previously dominant belief that technological advancements invariably benefit employment as a whole. While there remains a consensus that AI and automation enhance productivity, there is growing recognition among scholars that these gains do not necessarily translate into positive employment outcomes, nor are the benefits evenly distributed across sectors. Current research indicates that high-skilled jobs, particularly in sectors such as healthcare, are more likely to employ AI as a complementary tool.

Conversely, low-skilled workers face a higher risk of displacement due to automation. Nonetheless, the research landscape is complex and rapidly evolving, making it difficult to determine whether any single perspective, including the featured essay in this edition, can claim to offer a definitive answer. However, the essay provides a thought-provoking viewpoint that merits serious consideration.

The featured essay engages with a range of critical questions that are at the forefront of research on AI and automation. It examines how automation is reshaping job markets both in the short and long term and explores whether policy interventions, such as tax code reforms, can mitigate the negative impacts on labor. Additionally, the essay delves into the concept of "occupational stickiness" and its potential to slow the pace of job destruction. These issues are not only central to contemporary economic discourse but also crucial for readers' understanding of the future of work.

In this edition, the Economics Section seeks to contribute to the ongoing conversation about how AI and automation will shape the future of work. We invite readers to critically engage with these insights and to reflect on the broader implications for policymaking and labor market dynamics in an AI-driven economy.

Tanisha Sawa and Jonathan Ouyang
Perspectives Economics Section Editors

Evaluating the Economic Impact of Automation and AI: Theories for Policymakers

Pia Gupta

Introduction

Integrating artificial intelligence (AI) into the global economy heralds significant shifts; this essay explores the economic implications of widespread AI adoption on productivity, labour markets, and income distribution. Initially, enhancements in efficiency, as analysed through the Solow-Swan growth model and the task-based approach, are set to boost productivity. However, diminishing returns may eventually restrain this growth. Furthermore, the essay extends the discussion to labour markets, employing Structural Unemployment Theory and comparative advantage to examine how AI induces fundamental shifts. As illustrated by the Kuznets curve, these shifts create high-value jobs for skilled workers while displacing routine roles, impacting income distribution. This analysis aims to offer insights into the initial increase in income inequality, highlighting the transformative potential of AI to foster a more balanced income distribution as the technology becomes more accessible and its benefits more ubiquitous.

Influence on Productivity

Integrating automation and artificial intelligence into the global economy is a transformative process that profoundly affects productivity across sectors. Productivity, a pivotal measure of economic growth, reflects the efficiency with which inputs are transformed into outputs (Syverson, 2011). The forthcoming analysis will engage with the Solow-Swan growth model and the task-based approach, to demonstrate that AI advancements are set to boost productivity ma-

-rkedly in the initial phase. However, the principle of diminishing marginal returns will eventually temper this growth - as AI adoption matures, the global economy is expected to settle into a higher long-term growth trajectory characterised by gradual productivity enhancements.

The task-based approach provides a nuanced lens on how the relationship between human labour and capital-intensive machinery evolves, particularly highlighting the significant initial productivity boosts brought about by AI and automation integration. This approach illuminates the dynamic boundary between 'labour tasks' and 'capital tasks', revealing a permeable and shifting frontier in production processes (Autor, 2013) and underscoring the economic rationale behind the initial allocation of novel tasks to humans, leveraging their adaptability and flexibility. With time, as these tasks are standardised, they transition towards automation, where machines take over routine tasks, enhancing efficiency and reducing errors in work processes (Autor, 2013). Additionally, AI systems can learn and improve over time, offering the potential for continuous productivity improvements beyond initial automation. Furthermore, automating routine tasks allows for the strategic redeployment of labour to 'complex' activities, effectively leveraging innate human capabilities such as creativity, emotional intelligence, and sophisticated problem-solving abilities; the transition towards AI-driven processes is expected to bolster productivity by improving efficiency and innovation.

OECD survey data analysis unveils a positive impact of AI across varied workplace aspects within the finance and manufacturing sector (Lane et al., 2023). Utilising comparative analysis, manufacturing outstrips finance in reporting positive effects on productivity, the former at 63% and the latter at 57%, suggesting a more significant role of AI in automating and streamlining production tasks in manufacturing. This is further supported by the mode analysis, with 'Positive effect' being the most frequent outcome for productivity in manufacturing. Furthermore, when considering the predominant applications of AI, 52% of financial users engage in data analytics and 50% in fraud detection,

highlighting the sectoral emphasis on improving data-driven decision-making through leveraging AI. Correspondingly, in manufacturing, 60% apply AI to production and 58% to quality control, underscoring AI's pivotal role in enhancing product quality and manufacturing efficiency. The standard deviation for the positive effects of AI as reported by employers in the financial sector is approximately 11.63, compared with approximately 9.03 in the manufacturing sector, suggesting a greater variability of the perceived impact of AI in the financial sector. This sectoral variation in productivity gains from leveraging AI reinforces the transformative potential of AI across the economic spectrum.

Nevertheless, the OECD survey's insights possess limitations. Firstly, the sample across the Finance and Manufacturing sectors may only partially represent variations in company size, geographic distribution, and AI integration, potentially skewing the findings. To address this concern, future studies could ensure a more stratified sampling approach that captures a wider range of companies, ensuring more balanced representation. Additionally, cross-referencing the findings with industry-specific reports or government data could help verify the results and minimise potential biases. Additionally, response bias could influence the results, with entities reporting positive AI experiences more readily, causing an overrepresentation of positive impacts. To mitigate this, future surveys could employ techniques such as anonymous data collection to reduce bias. Alternatively, qualitative research methods, such as interviews or case studies, could complement the quantitative data, offering deeper insights into the range of AI experiences across different sectors. Finally, the temporal scope of the data captures a specific moment in the rapidly evolving landscape of AI; the survey's findings may only partially reflect the sustained impact of the technology in the long run. Longitudinal studies could be a solution to this limitation, tracking the same companies over time to provide a more comprehensive view of AI's long-term effects. Additionally, leveraging alternative data sources, such as real-time market data, ensures that the results remain relevant and accurate as the AI landscape continues to evolve.While the disparity in perceived benefits within the finance and manufacturing sectors ill-

-ustrates nuanced insights, the overarching trend confirms increasing productivity.

The Solow-Swan model suggests that while initial capital investments in AI technologies can lead to a surge in productivity growth due to improved capital-labor ratios and elevated economic growth levels, this boost is temporary due to diminishing marginal returns (Sorrel & Sijm, 2003). As AI technologies are increasingly deployed, each additional unit contributes less to productivity growth than the previous one. Evidence from recent studies, such as the BIS report (Aldasoro et al., 2024), support this view by showing that AI significantly raises productivity initially but at a decreasing rate over time. As economies integrate AI more deeply, they approach a long-term steady-state (Solow, 1956), where capital, output, and labor growth rates align. The BIS report (Aldasoro et al., 2024), highlights that sectors initially benefiting from AI, like manufacturing, eventually experience stabilised output growth as the broader economy adjusts, confirming the model's prediction that output per worker and capital per worker will stabilise at a higher level post-AI adoption.

Influence on Job Markets

A labour market is where a worker's time is exchanged for wages, characterised by geographic scope, industry sectors, educational qualifications, and specific occupations. This market facilitates the negotiation of wages and employment conditions between employers and employees. (Black et al., 2012). The impact of AI on labour markets is best demonstrated with the Structural Unemployment Theory, emphasising the mismatch between the skills possessed by workers and the skills demanded by new, technologically advanced industries. As AI integration advances, it inherently changes the nature of many jobs, creating a gap between current workforce capabilities and the new requirements demanded by AI-driven workplaces leading to structural unemployment, where workers find themselves inadequately trained for the emerging jobs created by AI innovations. The rapid pace at which AI evolves exacerbates this issue, making it challenging for the workforce to keep up without sustained and effective retrain-

-ing programs (Bihari, 1982).

However, examining the labour market's response to the advent of AI, an OECD employer survey reveals a telling preference across sectors (Lane et al., 2023): a higher value is placed on human skills and the contributions of highly educated workers over specialised AI skills. Specifically, 55% of finance and manufacturing employers prioritise the education of their workforce, while 49% and 58%, respectively, emphasise human skills. In contrast, only 42% in finance and 41% in manufacturing stress the importance of specialised AI skills suggesting a strategic pivot towards human-centric skills such as creativity and communication, underscoring the enduring importance of these attributes in the era of technological advancement.

As artificial intelligence (AI) becomes increasingly prevalent, its influence on job markets continues to grow, bringing into focus the theory of comparative advantage, a principle that economic actors, such as nations or firms, maximise efficiency by specialising in activities with a relative production edge enabling entities to trade. It underlines that global economic interactions are most beneficial when each entity focuses on and trades the goods they can produce more cost-effectively, optimising global resource allocation (Helpman, 2011). Traditionally applied to trade, this theory can be extrapolated to the division of labour between humans and AI, suggesting that the economy will benefit from human labour where it maintains a comparative advantage over machines. While AI may excel in tasks involving data processing and repetitive precision, humans will continue to be preferred for their emotional intelligence, creative thinking, and complex problem-solving abilities, which are irreplaceable in the workforce (Autor, 2013).

In the long run, the impact of AI on job markets may cause specific jobs to become obsolete as AI takes over routine and algorithmic tasks. However, new job categories will likely emerge, requiring skills that AI cannot easily replicate, leading to a higher employment equilibrium. In this transition, education and workforce training will play a pivotal role, empowering individuals to adapt to the

changing landscape. The future labour market, reshaped by AI, will value workers' adaptability and lifelong learning as much as their current skill sets, ensuring a dynamic and resilient human workforce in the age of intelligent machines.

Income Distribution

Artificial intelligence has the potential to reshape income distribution patterns within the global economy. In the short term, the proliferation of AI may contribute to widening income disparities, mirroring the initial upward phase of the Kuznets curve where rapid economic growth leads to increased inequality. However, over the long term, as AI becomes more ubiquitous and accessible, it possesses the transformative potential to foster a more balanced income distribution, aligning with the downward phase of the Kuznets curve. This analysis engages with the Kuznets hypothesis by studying the impact of AI integration on industrial shifts and its globalised impact, augmented by correlational data analysis to substantiate this thesis.

AI is radically transforming the industrial landscape, enhancing efficiency in production, data management, and decision-making processes. This technological shift, moving from traditional, labour-intensive Manufacturing to sectors demanding advanced technological acumen, mirrors the early industrialisation phases described by Simon Kuznets. As AI integrates into various industries, the demand for highly skilled professionals to develop, implement, and manage these systems has surged, commanding premium wages due to the specialised skills required. Concurrently, AI&'s capacity to automate routine tasks previously undertaken by lower-skilled workers leads to job displacement, exacerbating income inequality. This scenario, where economic benefits disproportionately accrue to those with sought-after skills, aligns with the Kuznets curve, hypothesising a bell-shaped relationship between development and income inequality (Nielsen & Alderson, 1997). According to Kuznets, as an economy grows, income inequality is likely to increase initially and then decrease once a certain level of economic maturity is reached, facilitat-

-ed by redistributive policies.

To further elucidate the economic implications of AI, a correlation analysis was conducted, examining the relationship between venture capital investment in AI in the US (Tricot, 2021) and income inequality, measured by the GINI coefficient (OECD, 2023), from 2013 to 2022; the selected timeframe reflects the evolution of AI from an emerging innovation to establishment as a significant force in the US economy. Venture capital is a type of private equity financing provided to startups that demonstrate potential for long-term growth (Hayes, 2020); the value of venture capital investment in AI in the US has risen from $2.26bn in 2013 to over $52bn in 2021 (Goldman Sachs, 2023). Increasing venture capital investment in AI in the US indicates robust sector development as such funding boosts confidence among investors about the future growth and profitability of AI technologies; this financial support enables AI companies to innovate and scale their operations, enhancing their ability to meet growing market demands and expand their technological capabilities. With the widespread adoption of AI across various sectors in the US (McKinsey & Company, 2023), reflecting a significant integration of these technologies into mainstream business operations, concurrently, there have been reported changes in the GINI coefficient, suggesting shifts in the income distribution that may correlate with the rapid deployment of AI technologies. The analysis revealed a moderate negative correlation of approximately -0.618, suggesting that increased venture capital investment in AI coincides with decreased GINI coefficients. This finding supports the hypothesis that while AI may initially exacerbate income inequality by creating high-value positions for a technically skilled few, it could eventually lead to broader economic benefits that reduce income inequality. As AI technologies become more integrated and accessible, the economic benefits permeate various sectors, leading to enhanced employment opportunities and improved productivity across a broader spectrum of the workforce.

Conclusion

In conclusion, this essay has examined the economic implications of the extensi-

-ive integration of AI on productivity, the labour market and income distribution. Initially, AI is posited to enhance productivity through improved efficiencies, aligning with Solow-Swan growth model and task-based approach insights. However, such growth is anticipated to stabilise due to diminishing returns. Furthermore, AI reshapes labour markets by fostering high-value, skill-intensive roles while displacing more routine jobs, consequently influencing income inequality. Overall, despite the challenges and disruptions brought about by AI, these advancements hold considerable promise for fostering economic growth and enhancing productivity across various sectors if strategic policymaking is implemented to navigate these transformations, ensuring equitable distribution of AI's benefits.

An implication of this research is encouraging businesses to consider strategies to mitigate the disruptive effects of AI on the workforce by enhancing education and training programs to prepare workers for the high-skill jobs created by these technologies. If the debate is to be moved forward, a better understanding of the long-term impacts of AI on different demographic groups and sectors needs to be developed. Studies could focus on developing more granular insights into the jobs most likely to be affected by AI and the effectiveness of policy interventions in real-world settings.

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AI, Automation, and the Demand for Labour

Jonathan Ouyang

Introduction

This essay aims to analyse the economic implications, particularly regarding labour demand, of widespread adoption of automation and artificial intelligence (AI). While economists en masse agree that technological innovation is beneficial to the economy in the long-run, its short-run effects are more contentious, especially in relation to employment. By examining history, one would be hard-pressed to ignore the remarkable leaps in standards of living and unprecedented economic prosperity brought about by technology, most notably by the Industrial Revolution. However, the extent of temporary unemployment from automation adoption in the Industrial Revolution remains unquantified (Vipond 2022), obscuring the short-term benefits of technological innovations.

One common argument proposed in the economic community is that technological innovations increases productivity, and increased productivity improves economic prosperity for a nation as a whole (West 2011). Consequently, the obtained benefits will trickle down to factors of production such as labour. However, this argument overlooks several nuances of the short-run economic consequences of automation that requires scrutinisation.

This essay will aim to contend the aforementioned argument, where I shall propose that the implications for labour demand depends on long-run and short-run factors: firstly, the nature of the technology in how it affects the task content of production – the allocation of tasks to different factors of production (Acemoglu and Restrepo 2019). And secondly, the "stickiness" of an occupation – the extent to which an occupation persists even in the face of imminent destruction. The paper will be broken down into three main sections, where I sh-

-all first explain the economic theory undergirding the long-run implications of automation. I shall then provide empirical evidence on the basis of the proposed theory. And lastly, I will discuss the idea of occupational stickiness, illustrating automation's short-run implications. With this methodology, it is my hope that this paper can facilitate a more refined understanding of the employment implications of automation.

The Economics of Automation

The economic cycle of automation begins with entrepreneurs, driven by self-interest, introducing new technologies to enhance productivity and streamline production. This process will displace existing occupations initially, but will then pave the way for new industries and jobs where greater benefits can be reaped. To take the example of transportation, its monumental progress is evidenced by, first, the arrival of steam engines, and second, that of internal combustion engines. However, for an economy previously reliant on horses and mules, occupations such as carriage and harness markers, blacksmiths, etc., became obsolete. Nevertheless, while many jobs were destroyed by this revolution, the innovations here also paved the way for new enterprises such as automobiles, oil, tourism, and more, creating bountiful new jobs and businesses (Alm and Cox n.d.). Today, few would question the productivity gains brought about by improved transportation and the subsequent prosperity that followed. This is the process of "creative destruction" coined by the economist Joseph A. Schumpeter.

However, one key assumption made thus far is that automation necessarily equates to innovations that drive productivity growth. Yet, this does not always uniformly hold true. Consider, for example, the instance of Tesla's excessive automation of the California production plant. In 2018, Elon Musk, the CEO of Tesla, acknowledged that excessive automation has impeded Tesla's Model 3 production due to a complex network of conveyor belts (IQS Directory n.d.). This case illustrates a "so-so" technology, where the adoption of capital-intensive methods achieved only marginally improved productivity, led to substantial job displacement while shifting considerable costs to consumers. Similar circumsta-

-nces can be observed with technologies such as self-check-out kiosks, automated customer service, basic online learning platforms, and more (Brown 2019). Therefore, the notion that all technologies have a net positive impact on the economy may be incomplete and requires further scrutiny.

Thus, adequately examining automation and AI's impact on labour demand requires analysing the diverse forces shaping employment. These include the productivity, displacement and reinstatement effects. To explain this conceptual framework, consider Figure 1a, which demonstrates a simplified task content of production, evenly split between labour and capital. Suppose, now, a new technology replaces some labourers, thus causing a displacement effect that reduces the labour share in production. The technology also causes two additional effects: a productivity effect, where increased productivity boosts the wage bill for non-automated tasks; and a subsequent reinstatement effect, delineated by the blue ring in Figure 1b, where the technology generate new tasks for which labourers have a comparative advantage. Thus, while the displacement effect reduces the slice of the pie for labour, the latter two effects will, in aggregate, increase the demand for labour, serving as a counterbalance to the displacement effect.

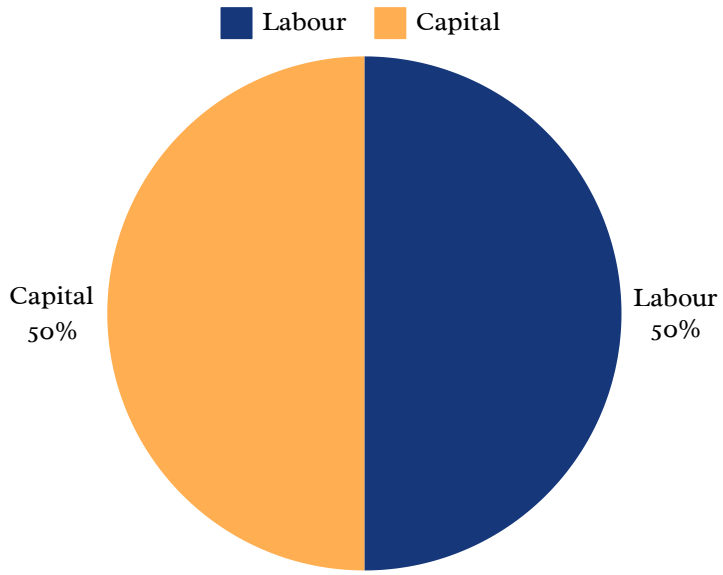

Figure 1a

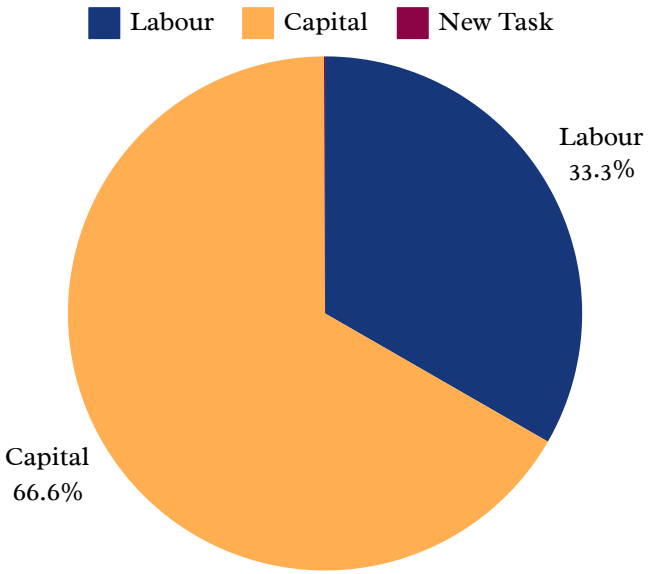

Figure 1b

In their paper, Acemoglu and Restrepo (Acemoglu and Restrepo 2019) proposes that this process can be organised into two distinct categories: the effect of automation on the labour demand, and the effect of new tasks on labour demand. The former is to be expressed as:

$$EffectofAutomationofD_L = ProductivityEffect + DisplacementEffect$$

This expression reveals that while automation may engender an expansion in the overall value of output, the extent to which labour reaps the benefits hinges upon the strength of the productivity effect relative to the displacement effect. In general, if wages are high and labour is scarce, automation results in a stronger productivity effect, thereby increasing labour demand. The opposite is also true.

In conjunction, the latter is to be expressed as:

$$EffectofNewTasksonD_L = ProductivityEffect + ReinstatementEffect$$

This effect illustrates that introducing new tasks always favours labourers as it allows them to employ their comparative advantage in these tasks, which increases productivity and subsequently leads to an increase in labour demand.

With the derived effects and the illustrated historical examples above, one can now extract a clearer implication of automation on employment. It is evident that while “brilliant” technologies propels an economy to new extents of opulence, “so-so” technologies, as coined by Acemoglu and Restrepo, result in a high displacement, low reinstatement and low productivity growth. Using this conceptual framework, I now present empirical evidence from 1987 to 2017 to illustrate the automation landscape.

Empirical Evidence

The data I present below, which will be largely US-centric, demonstrates that over the last four decades, automation has evolved not necessarily in the labourer's favour. Diagram 1 (Acemoglu and Restrepo 2022) reveals the trend of real wages of workers across different educational demographics. The illustration's most salient change is the stagnation or reduction in the real wage, particularly among less-educated men. This is driven by a reduction in productivity growth, brought about by the increasing adoption of "so-so" technologies.

In addition to a reduction in productivity, the adoption of such technologies has also stalled job creation. Diagram 2 (Acemoglu and Restrepo 2019) illustrates, in combination with the task content shifting against the labourers, the displacement effect has changed by 21% since 1987, while the reinstatement effect has only increased by 12% in the same period, in line with the proposed theory. Indeed, if excessive automation persists under the utilisation of "so-so" technologies, it is possible that labour demand would continuously drop to a disadvantageous position for mankind.

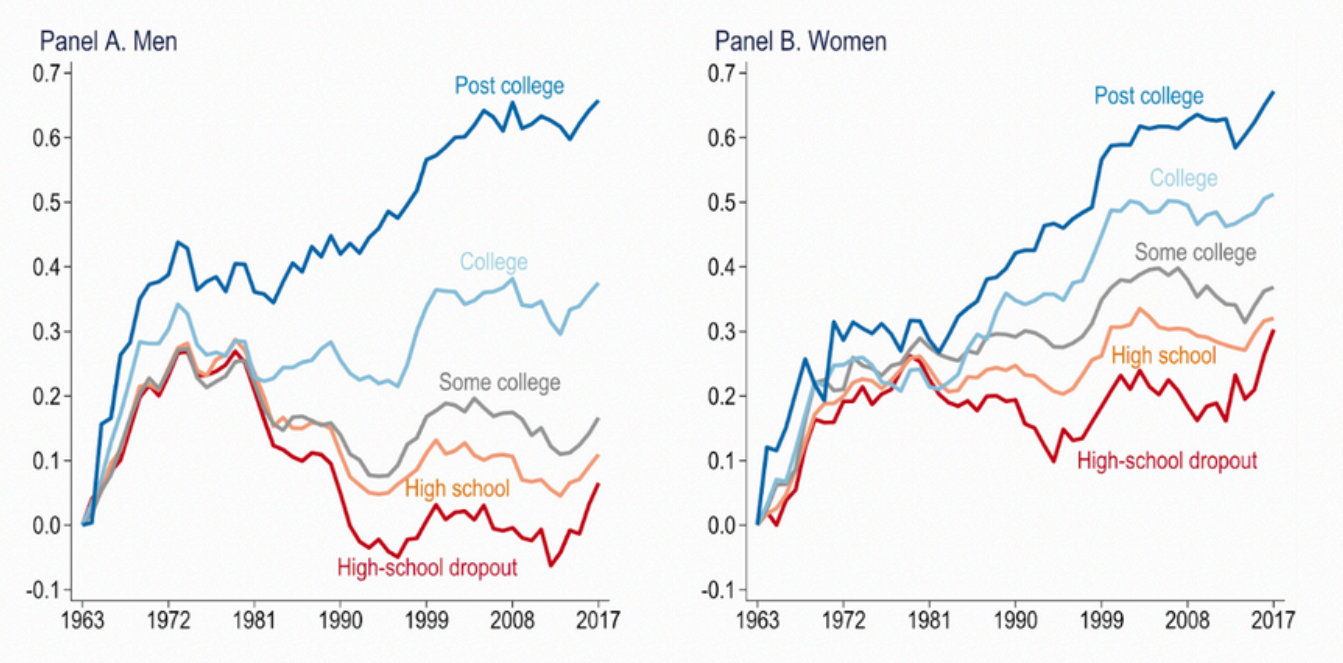

Diagram 1: Cumulative growth of real hourly wages by gender and education

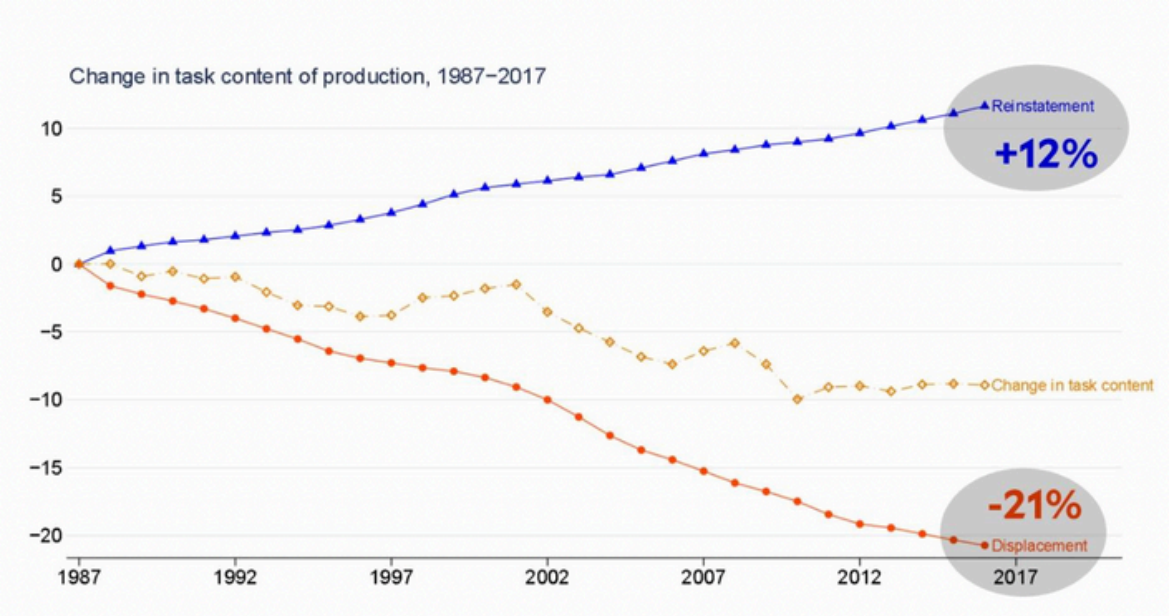

Diagram 2: Change in task content, reinstatement and displacement effects from 1987-2017

This predicament mainly stems from the adverse effects of an unfavourable tax code. The US tax system heavily subsidises the use of equipment, with capital taxed at around 5%, compared to labour's 25% (Acemoglu and Restrepo 2019). This helps to not only explain, in part, Tesla's tenacious attempt to automate, but also the current labour market landscape. It is thus not the failure of the market that has resulted in a disproportionate destruction of jobs, but the choice of policy. In order to remediate this quandary, a reconfiguration of the tax code is required. Acemoglu et al. suggests optimal tax rates of 18.22% on labour and 26.65% on capital could "reduce the range of automated tasks by 4.1%, increase employment by 4.02%, and increase labour share by 0.78 percentage points" (Acemoglu, Manera and Restrepo 2020). Thus, by rectifying the deficiencies within the tax code, it is possible that the long-run implications of automation and AI could be ameliorated.

Above, I have analysed how breaking down the various economic forces of automation assists with examining its long-run implications. In the final section of this paper, I shall examine automation's immediate implications with regards to the impending economic revolution and investigate why it might be overstated.

Occupational Stickiness

Although AI and automation advancement may significantly displace jobs –with estimates suggesting half are at risk (The Economist n.d.) – the pace at which this will occur is often overlooked. Historical data indicate that job destruction occurs slower than often perceived, demonstrating the "stickiness" of occupations. Train operators in the publicly operated London Underground exemplify this phenomenon, with their positions remaining stable despite available technologies for replacement.

Diagrams 3 and 4 (McLoughlin 2022) (Wells 2020) demonstrate the change in the nominal and real wages of train operators from 2011 to 2023 (note that due to a lack of publicly available data, the figures incompletely portray the trend. Nevertheless, this does not hinder the analytical possibilities). Over the past decade, nominal wages for operators have steadily risen; when adjusted for inflation with 1989 as a base year, real wages are shown to increase even more markedly. Excluding the 2020-2023 period marked by significant inflation due to the Covid-19 pandemic, real wages rose by 34.4%. Even by accounting for 2023, operators earn £59,864 per annum. were paid approximately 44.62% above the median wage of full-time employees living in London (Francis-Devine 2023).

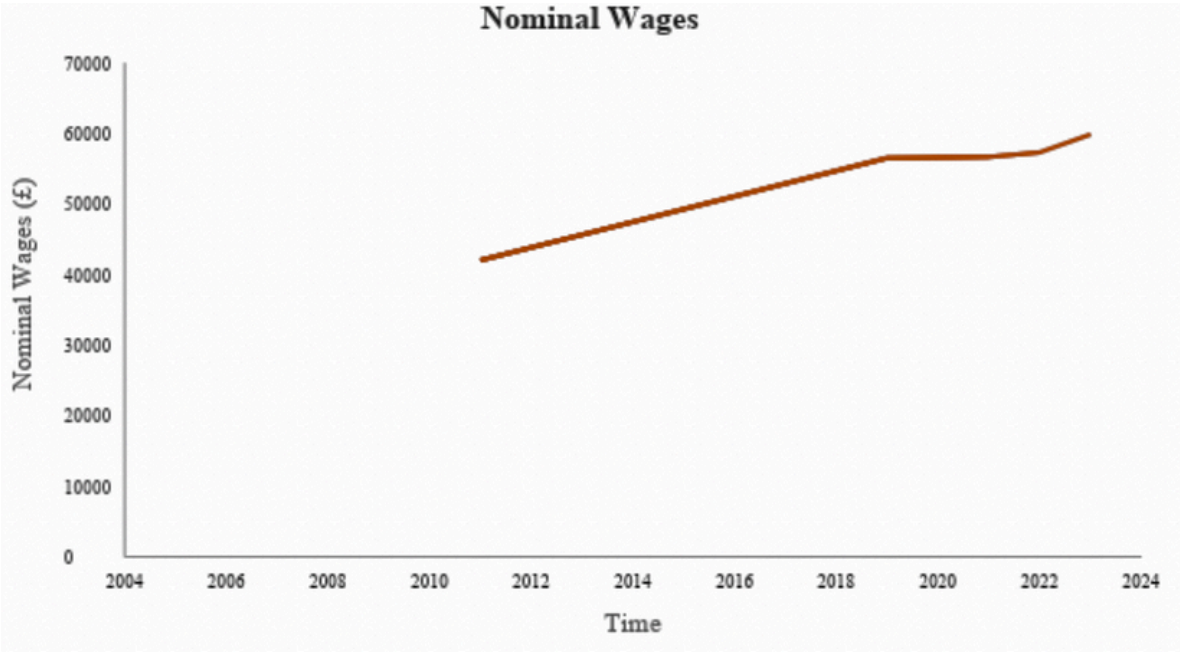

Diagram 3: Nominal Wages of Train Operators 2011-2023

Diagram 4: Real Wages of Train Operators 2011-2023

The trend continues when considering the changes in the number of operators employed by the London Underground. Tables 1 (London Assembly 2022) (London Assembly 2023) illustrates the hiring numbers of each service line in 2009 and 2022, where total employees increased from 3525 to 3639.

Service Line	2009	2022
Bakerloo	217	204
Central	491	514
District	501	500
Jubilee	356	386
Metropolitan	307	319
Hammersmith & City	268	255
Northern	566	644
Piccadilly	534	520
Victoria	285	297
Total	3525	3639

Table 1: Total Train Operators in London Underground 2009 and 2022

This reveals that the occupation of train operators remain as prominent as it used to be, despite threats from a competent replacement technology – driverless metros, existed since 1982 when it was first used in Lille, France (Hitachi 2023). The case of Underground train operators thus exemplifies high occupational stickiness and delayed job destruction.

It is worthy to note, however, that the London Underground is operated by the British government, and therefore enjoys some extent of governmental protection. Nevertheless, many jobs at risk from AI and automation are in heavily regulated sectors. Often, governments may deliberately slow the rate of job replacement for political reasons. This paper thus argues while AI and automation will transform the economy in unprecedented ways, they will not necessarily cause the widespread suffering often anticipated. Appropriately managed delays in job destruction could provide opportunities for job creation and resource reallocation, smoothing out short-term economic shocks.

Concluding Remarks

This paper aimed to clarify the long-term and short-term effects of automation and AI on the labour market by presenting two arguments about their economic implications. The first argument focused on the economics behind automation and, using the theoretical foundations, demonstrated that automation's long-run effect on labour demand rested in its ability to change the task content of production. The empirical data presented here illustrates that due to an unfavourable tax code towards labour, automation in the past four decades in the US has resulted in a heavier displacement effect compared to the reinstatement effect. As such, the change in the task content of production has shifted against labourers. If left to persist, this is indeed problematic. However, the paper has argued that this is largely down to a choice, and that a correction of the tax code may mitigate the negative consequences of automation and redirect it to benefit the job market.

The second argument demonstrated the short-run effects on labour demand, where job displacement in the face of AI is considerably protected by occupational stickiness. Using the London Underground train operators as an example, the paper argued that, in the face an imminent Fourth Industrial Revolution via AI, the rate of job destruction may be slowed by heavy governmental regulations in the job market, thus preventing the prophesised mass unemployment.

I conclude by arguing that competent navigation of the automation and AI landscape could promise a bright future. To do so, we must firstly amend the tax code to support innovations that complement labour rather than replace labour. Secondly, we should utilise the buffer period provided by occupational stickiness smoothly reallocate resources to usher in a new era. Considering AI as a potentially "brilliant" technology, the possibility of reversing the trend in diagram 2 is entirely plausible.

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FINANCE & BUSINESS SECTION INTRODUCTION

Over the past decade, rapid technological advancements have led to the widespread influence of artificial intelligence (AI), particularly in business and finance. These sectors, which drive much of society, have seen significant transformation through automation and AI. The emergence of sophisticated systems is revolutionising business interactions on an unprecedented scale. AI is not only enhancing market efficiency but also strengthening regulatory frameworks, ensuring competitiveness. This Winter Edition of Perspectives Journal examines these profound changes, offering insights into how businesses can leverage AI to their advantage while highlighting best practices for its effective use.

Research differentiates between automation and AI's impact on business practices, with a focus on AI's efficiency-enhancing capabilities. Automation tools, such as data analysis and chatbot feedback mechanisms, are increasingly being adopted by businesses—69% according to a recent Financial Times report (2023). The positive correlation between AI adoption and company growth is well-documented, with promising projections for its continued use. AI also enhances investment forecasts through machine-readable data, improving financial decision-making. However, there are notable limitations, such as high upfront costs and a shortage of AI expertise, which present challenges for widespread implementation.

Additionally, concerns arise around the ethical implications of AI, particularly its impact on job security and the risk of violating employment laws. AI should be used to assist human decision-making, not replace it. Over-reliance on AI must be avoided to mitigate fears about its capabilities. As AI continues to evolve, research is crucial to minimise the costs and challenges associated with its integration, ensuring businesses and financial institutions can thrive.

This edition of Perspectives aims to bridge the gap between academia and industry, exploring the impacts of AI on business and finance through real-world case studies. We hope this section provides valuable insights for your academic and career development in this rapidly advancing field

Raees Arif & Pia Gupta
Perspectives Finance & Business Section Editors

AI and automation – what the field means for businesses

Caitlin Carnachan

Introduction

Since its initial development in the late 1950s (Anyoha, 2017), Artificial Intelligence has undergone successive technological advances that have pushed the field to the forefront of contemporary media. Analysis conducted by PwC suggests that this relevance will prevail (Rao & Verweij, 2020), with projected 'size of economic prize' of the AI market accounting for up to $15.7 trillion USD of the global economy in 2030. Such rapid development of the field holds major socioeconomic implications, most tangibly within the changing practices of businesses and financial institutions. As Weitzman comments in his review of AI's transformational effects on business, companies which deny the performative powers of AI face increasing threats of falling behind competitors (Forbes, 2022). Traditional processes alone fail to equal the speed and accuracy with which AI powered methodologies operate and handle information, thus causing non-AI-adopting institutions' functionality to stagnate. Given the growing reliance on computerised assistance in modern professional settings, it is imperative for businesses to effectively pinpoint methods of capitalising on such technologies, while conceding to and minimising associated damages. Hence, this essay will discuss the merits of Artificial Intelligence when (and how) it is leveraged successfully, as well as acknowledging the limitations associated with employing new and potentially foreign systems.

Understanding Automation and Artificial Intelligence

Although the terms 'automation' and 'artificial intelligence' are often conflated, they are fundamentally different constructs in both purpose and basis. Process automation describes the mechanisation of repetitive manual tasks, generally without a need for active human interference post initial installation (Parr, 2021). Conversely, AI is a computerised system that mimics the human minds' cognition, decision making, and problem-solving proficiencies (IBM, 2023). It is formulated of large datasets administered through complex algorithms and learns through experience by finding sequences and patterns to further develop from (Maheshwari, 2023). Accounting for the depth and volume of the field, the main focal points for consideration in a business setting include machine learning, content generative AI, and overall data analysis (Lawton, n.d.).

AI in Business

From a business standpoint, AI and automation's ability to enhance efficiency and shorten process time makes it a pivotal factor in organisational functions and development. Among several broader purposes, it has historically been implemented through computerising tasks within data analysis, automizing routine operations, and 'chatbot' based feedback methods (Forbes, 2022). It is through a replication of human cognition that AI is able to perform informed decision-making tasks, including identifying and resolving system and data issues with productivity levels that are not attainable through human behaviours alone. This flexibility in use makes AI an optimised tool for streamlining both internal and customer service operations, extending across all bases of a company's core practices. Recent research studies have reported that 69% of companies integrate at least one system of Artificial Intelligence into their processes (FT, 2023), with a positive correlation between company size and AI adoption.

Despite data trends suggesting that AI's rapid development holds significant transformative implications for modern economics and business owners, Dennis Walsh from Goldman Sachs highlights that in their case, 'it is not going to revolutionise [their] approach to investing' (Goldman Sachs, 2023). Walsh places emphasis on the task simplification AI delivers, acknowledging its value as an enhancement feature rather than a cure-all. To this extent, immediate blind reliance or over dependence on the tool without sufficient foundational understanding would reflect negatively on an organisation's efficacy – where abusing AI's performative abilities and completely replacing current practices with computer-powered methods may become detrimental rather than beneficial. Nonetheless, large multinational companies such as the Chinese e-commerce platform Alibaba have seen significant growth post-adoption of Artificial Intelligence, making it a critical part of their success (Wang, 2024). Statistics show that the company has saved over a billion RMB per annum as a consequence of AI, with Alibaba's CEO Eddie Wu directly supervising further investment in four new ventures in the field (Olcott and McMorrow, 2024). Similarly, technological corporations like Microsoft and Apple have readily integrated AI into their product development and use, with Apple harnessing machine learning to create features on popular products such as the iPhone and MacBook (Marr, 2019).

Merits of AI in Business

With regards to such widespread use, it is AI's reduction of margin for human error, lessened review time and consequent mitigation of flawed deductions that makes the tool so invaluable. According to estimations conducted by McKinsey, generative AI holds the prospective ability to automate necessary work processes that in contemporary society would consume 60-70% of employees' time (Chui, 2023). The consequent manual labour and time saved can be re-allocated into other tasks, amplifying the overall efficiency of work and creating long-term company benefits for handling larger workloads in less time. AI also plays a notable role in providing customer support without manual, real-time person-to-person conversations.

Through natural language processing and machine learning, AI has developed to the point where it can answer customer concerns, as well as categorising customer data and performing sentient analysis without interference from human employees (Kleinings, 2023). This holds tangible positive implications for businesses, with AI projected to induce up to 40% increases in productivity by 2035, consequently leading to evident generation of higher revenue (Kleinings, 2023).

Distinct from customer service features, one of AI's most strongly advocated-for capabilities within business spheres is cybersecurity, with the founder of SparkCognition – a machine learning company – describing the tool as an 'indispensable ally' in computer defence systems (Uzialko, 2024). Referring back to a reduction of human error, AI's ability to efficiently and thoroughly score through large datasets upon detecting cyberthreats means that potential issues can be resolved before they develop, at a rate which is much more effective than the human eyes is capable of. Hence, with comprehension of the assets and functions of Artificial Intelligence, businesses can effectively administer it into their systems to maximise profit and efficiency – creating an optimised company environment. Adequate use of AI resources can be ensured by circulating information on how the systems function within company employees, with open communication and education on changes being made as a consequence.

Notable Successes by Industry

While AI development holds sector-wide benefits across all facets of business, the healthcare and financial services industries have specifically undergone significant, evidenced change for the better as a consequence of new technologies. Philippines' top finance app 'GCash' is a prime example of this, considered to be a pioneer in digital financial services within the country and catering towards a demographic of the new generation of young adults (Quinn, 2023).

Part of the mobile wallet service's success is linked with its hyper-personalisation software that was developed in collaboration with BCG X – the tech and design unit of BCG that fixates on entrepreneurship and moving to the future (BCG X, 2024). Comparative to the company's previous use of the legacy CRM program, an early generation customer relationship management software, BCG's up-to-date knowledge and employment of AI has generated revenue up to ten times higher than what GCash previously earned (BCG X, 2024). In leveraging the latest technology in accordance with innovative business practices, the app was able to revolutionise the banking systems of the Philippines, transforming the country's mobile financial landscape (Quinn, 2023). In 2022 GCash had 60 million users representing 83% of the adult population in the Philippines (WARC, 2022), and this figure has grown significantly to 76 million as of 2023 (Quinn, 2023). AI's pivotal role in customer management and engagement broadened the scope of clients, further delivering optimised services and demonstrating AI's indispensable value within future-driven financial organisations.

From a medical perspective, the field of healthcare is as broad as it is necessary, and AI is demonstrating that it is a fundamental tool to support and underpin processes in the field. Perceptual AI and intervention AI are considered two subsections that are specifically fundamental to healthcare, being technology for replicating the diagnostic capabilities of healthcare professionals and decision-making tasks on the treatment of patients respectively (Mundell, n.d.). The UK's publicly funded National Health Service (NHS) has recently signed a Collaboration Charter alongside the Incubator for Artificial Intelligence (i.AI) to actively employ AI in its practices for the improvement and quickening of patient care (Burghart et al., 2024). While the agreement sets in place opportunities and policies for future implementation of AI as the field is further refined and understood, it comes about as a consequence of already visible successes within the healthcare industry. As the Health Minister Lord Markham outlines, AI's transformative powers have already 'halved treatment times for stroke patients', 'boost[ed] productivity', and simplified GP appointment booking systems (Lord Markham CBE, 2024).

Limitations of AI in Business

Despite Artificial Intelligence's apparent advantages, it remains under research and development as an imperfect practice. Since AI is perceived as a relatively new field of study, not only are there hesitations from consumers in accepting use of the tool, but its continuous growth also means that it is in a constant state of fluctuation. While AI holds extremely powerful data analysis and management capabilities, it is as of yet incapable of replicating human beings' creative liberty, awareness of societal standards, and abilities of empathy (Montemayor et al., 2022). In instances where customer support 'chatbot' features are present, this limitation becomes particularly evident. Most sites accommodate for this by retaining an option to communicate with human employees upon failure of AI generated chat responses, signalling that an entirely AI dependent site would be insufficient to gain complete customer satisfaction. However, in spite of the supposed availability of human assistance, it can be difficult for consumers to bypass the initial communication with AI – potentially resulting in customer frustration and animosity.

Further, there are fears redundancy and mass job displacements will occur as employees' roles are taken over by the more efficient, cost-effective use of AI (FT, 2023). Such concerns are not unfounded, with generative AI possessing the potential to completely take over the work of current employees without transgressing any laws (Ashurst, 2023). While such an outcome is possible, Goldman Sachs published an article mediating consternation over the prospect, arguing that the hypothetical consequence is not probable as the purpose of AI is not to be a job replacer but rather a job simplifier (Goldman Sachs, 2023). It is a creation by humans to assist humans, and should consequently be a cause for optimism rather than alarm amongst the workforces. Though this may soothe some fears surrounding the tool, it could be argued that this is an idealistic perspective which only caters to limited demographics and does not serve 'disposable employees'.

Other limitations lie in the foundation of AI itself. Since it learns through processing data, any flaws lying within the data are translated into the system, resulting in that particular function being impractical in reality and based off of misinformation. There is an ethically grey area around liability where AI is involved, in the instance where AI makes a mistake that causes real world damages or harm (Chowdhury & Sadek, 2012). Bearing this in mind, there has been considerable backlash from ChatGPT, a virtual assistant powered by OpenAI that is becoming increasingly integrated into society. The model has been recorded to provide misinformation to users in an attempt to sound more 'articulate' and academic, creating fake source citations and supporting statistics (Chowdhury, 2023). While such limitations can be specifically attributed to AI in a business setting, there are further long-term fears relating to AI developing beyond human standards and learning to redesign itself (Investopedia, 2023). Ultimately, such trepidation undermines AI use irrespective of its validity, presenting significant issues for businesses hoping to employ AI by lowering customer base and potentially employees' perception of safety.

Mitigating Risks, Proposed Solution, and Implications

Combatting customer concerns around AI requires complete transparency in business practices, with readily available descriptions of how AI is integrated into processes in order to create a sense of security and understanding for consumers. Adopting such an outlook also necessitates that the organisation holds a complete and thorough comprehension of the tools' functions, therefore lowering the risk of leveraging a foundationally erroneous system. Ultimately, empirical evidence seems to advise that AI is not yet at a stage where it can be considered as anything other than a tool, where extreme dependence on AI gives rise to further complications by failing to account for areas in which human cognition remains superior (Cremer & Kasparov, 2021). By acknowledging this, criticisms regarding AI's shortcomings can be nullified, instead proving its effectiveness in augmenting human acumen.

This does not imply that the rapid of evolution of AI is no longer a cause for concern, however it highlights that such a fatalistic perspective of the field will reduce the effectiveness and productivity AI can deliver within business organisations, without a strong enough basis for criticism. Predictably, a major concern is AI-caused redundancy. It is noteworthy in consideration of this issue that the displacement of certain jobs makes room for newer opportunities within the growing field. The study of artificial intelligence has been, and will become, much more prominent – opening up new jobs in research, maintenance, and use of the tool with a value growth of up to twentyfold its current worth by 2023 (Thormundsson, 2024). With respect to these factors, the advantages of AI greatly outweigh the drawbacks, meaning it is a natural course for the use of AI to steadily grow amongst businesses and competitors. As long as precautionary steps are taken to mitigate potential complications, businesses will be able to make great progress by implicating Artificial Intelligence into their practices.

Importantly, regulators and policy makers should provide informed decisions in coordination with those knowledgeable about the industry, generating strict protocol to ensure ethical boundaries are not breached and discrimination is eradicated within the use of AI. Particularly within healthcare and customer facing fields, AI processes should undergo several rounds of testing with information remaining openly accessible to those who will be exposed to the technologies. Bearing this in mind, organisations must ensure that employees receive sufficient and encompassing training on AI practices, where their understandings of what it is and how the company-specific systems function are solidified. By investing in this extra training, organisations may gain a competitive advantage against others in the field who employ the same systems, as employee confidence and morale with handling the technology is fortified. Further, anticipation for AI growth alongside the development of more concrete policies suggests that investors should take into account the type and purpose of the AI being used, along with the company's method of integrating it into their day-to-day activity. An organisation with an in-depth understanding of how the systems work will be able to maximise its efficiency, and consequently accelerate their own growth.

Conclusion

In summary, Artificial Intelligence is a tool that should augment and assist human intelligence, empathy, and deduction in business practices. Organisations must acknowledge that the field of Artificial Intelligence is not in a state of plateau, but instead is constantly expanding and reaching new discoveries that they must adapt to. Rather than wholly centralising around AI mechanisms, businesses should focus on methods of improving their current processes with the help of AI. It is an area with great latent potential for capitalisation and should undoubtedly begin to be adopted by most businesses, as trends show has already begun. Overarching fears of Artificial Intelligence should not be a serious hinderance to businesses considering use of AI, only acting as precautionary warnings with fallbacks set in place in the case of failures.

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Impact of automation on accounting and financial practices

Yunxuan Shi

Introduction

The convergence of automation and Artificial Intelligence (AI) demonstrates immense revolutionary power and transforms the fundamentals of accounting and finance operations in the fast-changing global financial environment. Organizations should enhance operational efficiency and decision-making accuracy to preserve a competitive advantage as the global marketplace expands and competition intensifies. AI technology has evolved into a vital instrument in this process to accelerate this change. Artificial intelligence (AI) has numerous applications, from automating routine transaction processing to supporting intricate financial decision-making strategies. AI technology is assisting businesses in adopting data-driven decision-making, optimizing resource allocation, and strengthening their capacity to adapt to market fluctuations. Simultaneously, AI may offer financial analysts vital assistance tools by swiftly analyzing massive amounts of data, observing patterns and trends, and forecasting future market movements. Implementing such technology expedites the production of financial reports while increasing reporting accuracy.

Furthermore, AI systems can now automatically detect abnormal patterns by learning from an organization's historical transactional data with the advancements in Machine Learning technology (Berdiyeva et al., 2021), which is crucial for risk management and auditing. These innovative technologies provide more effective control of financial risks and allow businesses to adapt their strategy in the global marketplace to cope with the constantly changing economic landscape. Nevertheless, there are potential issues associated with the broad utilization of AI, including challenges related to consumer privacy and security driven by the leaking of sensitive data, over-reliance on AI, and unemployment concerns. In brief, this essay will begin by highlighting the benefits of AI and automation in accounting and financial practices in making decisions, producing financial reports, auditing, and risk analysis. Subsequently, it will explore adverse impacts associated with the advancement of this technology in this industry.

Integration of AI in Financial Decision-Making

Artificial Intelligence solutions have increasingly become essential in optimizing traditional financial business procedures in the rapidly changing financial industry. Many financial organizations are substantially investing in gaining data science and machine learning capabilities, ranging from classic hedge fund managers and investment and retail banks to contemporary financial technology service providers (Wall, 2018). The financial industry is significantly impacted by the development of machine-readable data throughout the financial system, supported by continuous advancements in computing capacity and storage (Goodell et al., 2021). The increase in digestible data has contributed to more effective financial decision-making. Artificial intelligence can filter out more accurate data to generate more accurate forecasts. Financial organizations may use AI to evaluate historical data patterns to forecast market trends and future movements.

JPMorgan Chase employs AI to operate a predictive modelling engine that analyses news worldwide to anticipate how it could affect the market (Davenport, 2019). With the real-time research, traders may forecast stock changes and achieve a competitive advantage. Financial institutions have a better opportunity to reach correct judgments and cut down on fraudulent behavior when credit risk and consumer behavior, which are factors in decision-making, are also predictable. According to Lindner (2024), AI in accounting can help reduce the risk of fraudulent activity by 60%. AI may improve customized service, customer experience, and trust in decision-making planning. It can also boost consumer confidence and loyalty, strengthening businesses and customers connections (Yue, 2024).

The availability of AI and big data allows for credit scoring using alternative information such as transaction history, online behavioral patterns, risk tolerance, and many other potential sources of information not commonly found in traditional banking (Mhlanga, 2020). As a result, this can assist financial institutions in tailoring relevant products and services to customer expectations and enhance their credit risk management, compliance, and fraud detection capabilities by incorporating chatbots and face recognition systems. Using banks as an example, AI may help banks better assess and comprehend client preferences by using transaction models and other data sources to assist them in understanding customer behavior. When a consumer books a flight using a debit or credit card, for instance, AI will provide pertinent information and offers that are specific to that customer. Meanwhile, a bank may analyze all potential risks using a customer's past conduct as a basis for offering a customized loan. In sum, the large volume of user data that AI analytics processes allows financial institutions to observe what consumers truly want, are willing to pay for, and are trying to avoid, which is critical for the institution to design appropriate projects and initiatives.

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AI's Impact on Financial Reporting and Auditing

The application of artificial intelligence also has significant implications for financial reporting and auditing. Traditional accounting requires a high degree of accuracy, and, according to Stein Smith (2018), traditional methods such as manual data entry, manual account classification, and the use of paper records are labor-intensive, time-consuming, and prone to human error, which limits the speed and efficiency of financial reporting and analysis. Simultaneously, the advent of artificial intelligence (AI) technology allows accountants to concentrate on more strategic duties like company planning and advising services. Basic procedures are handled by algorithms, which lowers the possibility of human mistakes. Companies that use AI accounting processes can reduce manual errors by 20% (Lindner, 2024). AI algorithms have the ability to spot irregularities or discrepancies in financial data that a human auditor could have missed, resulting in more thorough and higher-quality financial reporting To a certain extent, this also reduces the cost of labor and time. Furthermore, according to Munoko et al. (2020), artificial intelligence is utilized in auditing to perform accounting and audit operations such as reviewing the general ledger, tax compliance, generating working papers, data analysis, expense compliance, and fraud detection.

The World Economic Forum (2015) predicts that AI will perform 30% of company audits by 2025. A significant advantage of AI in auditing is its capacity to gain real-time insights into unstructured data and analyze numerical, textual, and visual data to enable continuous auditing (Zhao et al., 2004). Unlike traditional methods, which typically have a time lag between data entry and report generation, AI systems monitor the dynamics of financial transactions in real time, provide instant analyses, react immediately to financial information, identify potential problems as they arise, and are not reliant on routine audits. Hasan (2022) suggests that continuous auditing improves audit efficacy and lowers the risk of fraud.

AI in Risk Management

Financial risk management can also be enhanced by artificial intelligence technology. AI has become indispensable in modern financial risk management. Traditional methods and techniques have become costly and time-consuming. AI algorithms can analyze vast amounts of structured and unstructured data to identify minute risk factors in various financial operations. The risks that AI may identify package credit, market, and operational risk (Bogojevic Arsic, 2021). Saravanan and Sujatha (2018) suggested that the critical technology of AI is machine learning, which can be categorized into supervised and unsupervised learning. While unsupervised approaches are used to classify data better, supervised learning is based on data acquired for result prediction. This technique is widely applied in financial risk management, especially in credit risk management for credit repayment risk determination and credit assessment (Hamdy & Hussein, 2016).

Credit risk results from default or a decline in the borrower's credit quality (Caouette et al., 1998). Credit risk management is the process of identifying and analyzing risk factors, measuring the level of risk, and selecting appropriate management measures for credit activities to reduce credit risk. By integrating non-traditional data sources like social media activity, online purchase history, and mobile phone usage patterns, AI can offer a more thorough profile of a borrower's financial behavior and credit risk than traditional techniques. The application of AI can improve credit decision-making by enabling more accurate detection of credit events and estimating the default cost.

Furthermore, machine learning algorithms allow for more flexible and predictive credit risk assessment by dynamically modifying credit score criteria in response to shifting borrower characteristics and market conditions. Market risk is the possibility that shifts in price levels or market price volatility would result in fluctuations in a portfolio's value (Dowd, 2005).

The Financial Stability Board (2017) notes that every stage of market risk management benefits from the application of artificial intelligence, from data preparation to modelling, stress testing and model validation. In addition, artificial intelligence has also significantly reduced the operational risk of losses brought on by human mistakes and technological ineptitude, including poor procedure and management (Robertson, 2016). AI may cut down on time-consuming, repetitive jobs and procedures—for instance, by lowering the number of processes that need evaluation. AI is also capable of more thorough data analysis, which allows it to separate genuinely pertinent information and provide more straightforward and valuable information. In short, financial risk management can become more effective, affordable, competitive, and predictive with the assistance of AI.

Challenges of applying AI

Although artificial intelligence (AI) has significantly improved the efficiency of accounting and finance procedures, it also presents a variety of significant difficulties. Firstly, establishing AI systems may take much work, requiring businesses to commit large sums of money in advance for personnel training, software development, and infrastructure setup. The initial investment required for implementing AI may be prohibitively expensive for small and medium-sized enterprises. Furthermore, the subsequent implementation and maintenance phases incur continuous costs that may significantly strain businesses. Financial organizations and businesses may also have trouble recruiting employees with the necessary expertise. AI systems also require large volumes of data to train and enhance their algorithms. Nonetheless, there are data security and privacy issues, considering this data frequently contains sensitive financial information (Rane, 2023). Significant financial losses and damage to one's reputation might result from unauthorized access to financial data or data breaches. Consequently, organizations ought to establish robust security measures and restrict data access to safeguard customer privacy and security as well as financial data.

Ensuring data privacy and security has thus become a top priority. As artificial intelligence becomes increasingly prevalent, people in the financial sector may become excessively dependent on it and disregard the value of human judgement and experience when making decisions, which might have disastrous effects because artificial intelligence is not flawless. Oluwatobi Opeyemi Adeyelu et al. (2024) claim that biases in the historical data used for training might affect the algorithms of artificial intelligence, causing inaccuracies in the data it processes and potentially biased decision-making. For instance, artificial intelligence-generated credit score models can treat particular groups differently, resulting in unfairness in financial services. Moreover, potential job losses must be taken seriously (Nguyen & Vo, 2022). A recent study by FintechOS shows that nearly 73% of US and UK financial business professionals believe adopting AI would render them obsolete (Chmiel, 2023). Accounting and financial experts may lose their jobs due to AI systems automating repetitive and regular routine tasks. Businesses ought to leverage the extra capital that accumulates due to higher productivity to produce updated machinery, expanding job prospects and lowering job losses.

Conclusion

In conclusion, artificial intelligence has tremendous potential for altering accounting and finance procedures concerning risk management, financial reporting, auditing, and decision-making. Nevertheless, it also introduces many challenges and obstacles that must be addressed. Implementing AI may be costly for many organizations, especially small and medium-sized ones with limited resources, due to the significant upfront investment required, technical expertise, and ongoing maintenance costs. In addition, the inherent risks associated with data security and privacy, combined with potential biases in AI systems, bring up moral and legal issues that must be resolved.

Moreover, the potential job displacement due to automation is another obstacle to using AI in accounting and finance. Nonetheless, companies may be more effective in their practice of AI in accounting and finance by proactively addressing these issues, deploying AI in a responsible and ethical manner, striking a balance between data security concerns and data availability, and mitigating AI's impact on employment opportunities.

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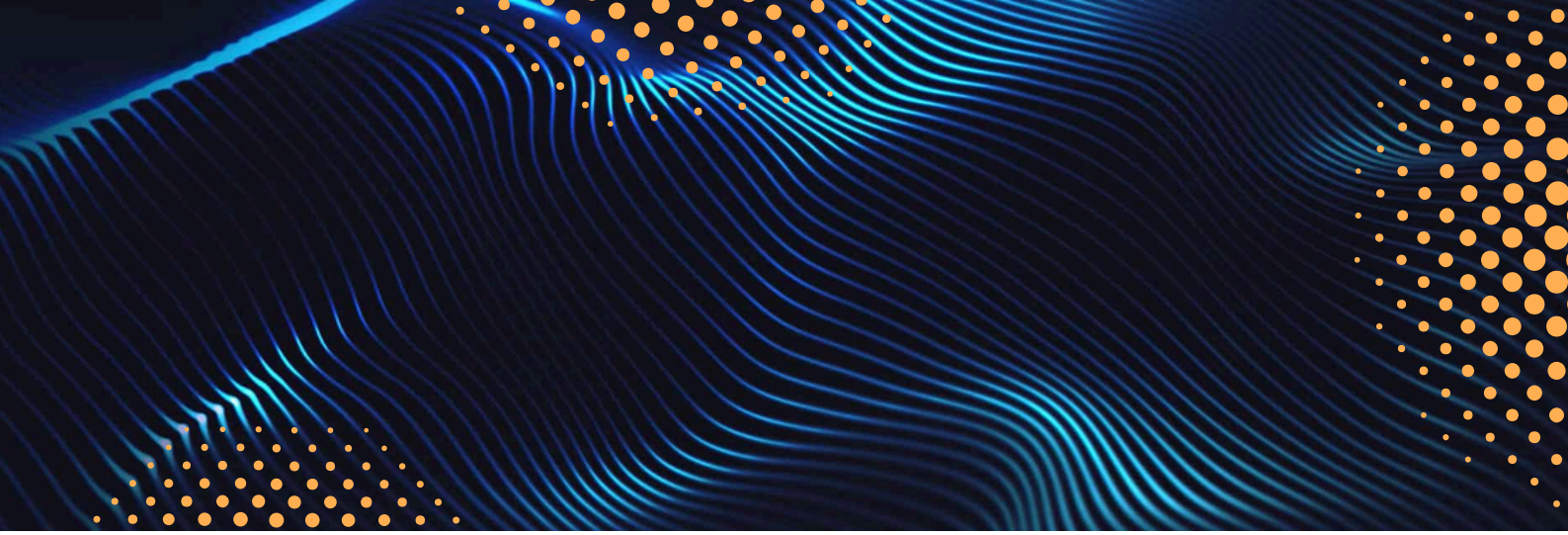

MANAGEMENT SECTION INTRODUCTION

AI, this; AI, that - with increasing numbers of businesses globally claiming to be an "AI-first company", it is no secret that artificial intelligence has revolutionised the world, and is likely here to stay. Our diverse and globalised cities, corporations, and everyday lives are driven by data. Hence, harnessing AI tools to sift through and make sense of the large amounts of amassed data from both local and global customer bases might be perceived as an obvious route to greater management efficiency.

But *should* AI be utilised for management strategies?

This latest edition of Perspectives delves deeper into this question. Both of the pieces in this section explore how AI has been harnessed for marketing strategies.

They highlight that while predictive AI algorithms and automation opens doors for greater personalisation – therefore, greater customer satisfaction – and efficiency, these rapid technological advancements might precede less human involvement in marketing. Simultaneously, both pieces acknowledge the looming concerns regarding data privacy and the ethics involved in the usage of artificial intelligence. How might these concerns be remedied? Is the human factor still an

essential factor for management to consider? The pieces in this section provide two of many perspectives on this.

Beyond this, you might ponder: what else lies in store for the field of management?

The Covid-19 pandemic may feel like a distant memory, but its effects on businesses remain significant. Surprisingly, recent evidence shows optimism among managers in their post-pandemic operations. Is this really the case? What other insights have emerged? Meanwhile, the global cost of living crisis is adding strain on employees, leaving management to address negative emotions and lack of focus. Sustainability and corporate social responsibility (CSR) are also more pressing due to alarming climate statistics, with corporations contributing heavily to global CO_2 emissions. Lastly, businesses must adapt to the impact of global politics and conflict. How do these challenges affect them? We hope to see these topics explored further in future editions.

But for now, we hope that the pieces that we have curated for you in this edition prove to be insightful, and we hope to hear your thoughts on them, too!

Jasmine Surif
Perspectives Management Section Editor

Enhancing Customer Experience through Personalized Marketing AI in a Globalized World

Natalie Wagner

Introduction

In an era of unprecedented globalization, businesses must innovate constantly to connect with a global customer base and enhance their satisfaction. Globalization, a complex set of processes influencing everyday life on a large scale, involves the increasing interdependence and interconnectedness of economies, populations, and cultures across the globe, introducing new opportunities, and exerting pressure on traditional structures (Giddens, A, 2002). Over a trillion dollars are turned over each day on global currency markets, a significant increase since the 1980s, driven by technological advancements (Friedman, T. L, 2005) and Automation and Artificial Intelligence (AI) have emerged as powerful tools in modern marketing strategies, enabling companies to transcend geographical and cultural barriers while delivering personalized experiences.

The utilization of Artificial Intelligence (AI) holds promise in fostering interconnectedness, despite arguments that AI cannot read human predictions better than humans themselves. While it's true that AI lacks the capacity to relate to human experiences on an emotional or intuitive level, its statistical prowess and ability to process vast amounts of data offer unparalleled opportunities for predicting human behaviours. In a world inundated with data beyond human consumption capacity, AI algorithms can sift through immense datasets to discern patterns and trends, enabling companies to anticipate consumer preferences, market trends, and societal shifts with greater accuracy. This predictive capability empowers businesses to tailor their offerings to diverse

global audiences, enhancing customer satisfaction and fostering cross-cultural understanding. By leveraging AI-driven insights, companies can transcend geographical and cultural barriers, creating products and services that resonate with individuals across the globe. Thus, while AI may not possess human-like empathy, its analytical capabilities play a crucial role in driving interconnectedness in an increasingly globalized world to boost customer experiences. Through real-life examples of successful implementations and suggestions, we will examine how AI can foster a more engaging, efficient, and satisfying customer journey. This essay explores how AI-driven strategies enhance customer experiences, emphasizing globalization and how the interconnectedness of the world plays a crucial role.

Personalised recommendations

AI algorithms play a pivotal role in analysing vast amounts of data from customers' browsing history, past purchases, and expressed preferences to generate highly personalized product recommendations. As highlighted in Netflix's information hub for Personalization, Recommendations, and Search research, "Recommendation and Search algorithms are at the heart of Netflix's services," showcasing the critical importance of personalized suggestions in enhancing member experiences worldwide. This commitment to continuous improvement and advancement underscores the company's dedication to catering to diverse tastes and preferences across different regions and cultures. Leveraging collaborative filtering and content-based filtering techniques, this personalized approach extends beyond the title selection layer, as Netflix explores new ways to present recommendations and engage members with its systems. Through research in machine learning areas such as recommender systems, contextual bandits, reinforcement learning, and natural language processing, companies use this technique to minimize browsing time while maximizing enjoyment for its global audience, fostering greater satisfaction, loyalty and engagement with brands.

Another company that effectively employs AI to dynamically adjust content layouts and product displays based on customer profiles is Spotify. Through its streaming platform, they utilise machine-learning algorithms to analyse user listening history, preferences, and behaviour to generate personalized playlists and recommendations. By considering factors such as the user's location, cultural context, and language, Spotify tailors its suggestions and promotions to create a more personalized and engaging interaction. This commitment to personalization is underscored by Spotify's design philosophy, which prioritizes engaging, simple, and enjoyable experiences for users, as highlighted by Emily Galloway, Spotify's Head of Product Design for Personalization. For instance, Spotify's "Discover Weekly" playlist curates a selection of songs every week based on the user's listening history and preferences. Additionally, Spotify's recommendation algorithms consider factors like genre preferences, artists followed, and user-generated playlists to deliver a customized music experience. Furthermore, Spotify's focus on putting human needs first amidst technological advancements ensures that their AI-driven personalization efforts not only enhance the browsing experience but also foster deeper connections with users, ultimately solidifying loyalty to the platform.

However, the integration of such detailed contextual data raises substantial privacy concerns. Collecting and processing real-time data about a user's location and activities can be perceived as intrusive, leading to potential backlash and mistrust. To mitigate these concerns, it is crucial for companies to prioritize transparency and user consent. By clearly communicating how data is collected and used, and ensuring that data is anonymized where possible, companies can foster trust and obtain explicit user consent for contextual data usage. This approach not only aligns with ethical standards but also addresses the issue of potential biases that might arise from algorithmic decision-making. Moreover, misuse of personal data can lead to significant risks, such as identity theft and unauthorized surveillance; for instance, in 2020, over 37 billion records were exposed in data breaches, illustrating the magnitude of potential harm (Köbis N. C, Starke C, Edward-Gill J). A real-life example addressing these ethical concerns is the recent adoption of the Artificial Intelligence Act by the European Parliament. This legislation aims to protect fundamental rights and promote

transparency by banning high-risk AI applications that threaten citizens' rights, such as biometric categorization and emotion recognition in sensitive environments. It mandates transparency for general-purpose AI systems and includes measures to support innovation while ensuring human oversight and compliance with fundamental rights. By incorporating such regulatory frameworks, companies can effectively address privacy concerns and foster a positive, trustworthy customer experience.

Sentimental and Emotional Analysis

Moving onto Sentimental Analysis, AI can analyse social media posts, reviews, and customer feedback in real-time to attract public sentiment towards a brand. This immediate analysis allows companies to quickly address feedback and reinforce positive interactions, thereby staying in-tuned to the evolving perceptions of their brand. In a globalized context, sentiment analysis helps businesses understand the perception of their brand in various regions, enabling them to make informed decisions and tailor their strategies accordingly. For instance, Coca-Cola utilizes AI-driven sentiment analysis to monitor social media and gather real-time feedback on its marketing campaigns. As Stuart Ward, Head of Sales Capability at Coca-Cola HBC, noted, the company aims to digitally connect with 100% of its customers, leveraging platforms like Customer Gauge to listen, understand, and act on feedback in real-time. This approach allows Coca-Cola to adjust its strategies to better resonate with its global audience, ensuring that its messaging remains relevant and impactful across diverse cultural contexts. This strategy exemplifies how AI, despite its inability to relate on a human level, processes vast amounts of data to predict likely behaviours, creating a more interconnected and responsive business environment in an expanding globalized world. Such strategies improve customer satisfaction by ensuring that businesses can quickly and effectively address customer concerns and preferences, fostering a sense of connection and responsiveness that enhances the overall customer experience.

Delving even deeper into analysing sentiment, AI-powered emotion detection enables companies to respond to the emotional tone of customer interactions

with greater empathy and understanding. By detecting subtle emotional cues, AI can tailor responses to be more empathetic and supportive, thereby enhancing the overall customer experience. This capability is invaluable for global companies dealing with a diverse customer base, as it allows them to adapt their communication style to different cultural contexts and emotional cues, thereby building stronger customer relationships. For example, Apple utilizes emotion detection in its customer service operations to identify when customers are frustrated or dissatisfied. This enables customer service representatives to respond with greater empathy and provide solutions that address the customers' emotional states, thereby improving the overall service experience and fostering deeper connections with customers worldwide. Furthermore, Apple is developing an AI-powered health coaching service, codenamed Quartz, which uses data from Apple Watch to create personalized coaching programs. By leveraging AI's data-driven insights, companies can transcend geographical and cultural barriers with more detailed data collections, creating a more interconnected global market where businesses can effectively address the emotional needs of their customers. Ultimately, such an approach enhances customer satisfaction and loyalty by demonstrating genuine care and understanding in interactions, reinforcing the value of AI in fostering deeper, more meaningful customer relationships in a rapidly globalizing world.

Integrating sentimental and emotional detection into customer interactions can significantly enhance trust and engagement by making communications more empathetic and responsive. Emotional AI has the potential to transform how companies interact with their customers by accurately identifying and reacting to emotional cues. This empathetic interaction can improve customer satisfaction, as it allows businesses to address not just the practical needs of their customers but also their emotional states. However, the effectiveness of this technology is currently limited by the accuracy of emotion detection and the variations in how different cultures express emotions. To overcome these limitations, it is essential to train AI models on diverse datasets that represent a wide range of emotional expressions across various cultural contexts. Additionally, continuous updates based on user feedback can help refine these models, ensuring they remain

relevant and effective. As AI continues to evolve, the insights from "The Future of Artificial Intelligence" by Allison Berke highlight the critical importance of balancing technological advancements with ethical considerations. Ray Kurzweil's optimistic view suggests that emotional AI, will significantly enhance human capabilities by enabling machines to perform complex tasks like nuanced emotional recognition and response. However, the rapid development of AI also comes with risks, such as the potential for unintended consequences if AI systems misinterpret emotional data or if they are used unethically (Barrat. J, 2015). This emphasizes the need for robust ethical guidelines to ensure that emotional AI benefits society without compromising individual privacy or security. Ultimately, by addressing these challenges and incorporating ethical safeguards, companies can leverage emotional AI to foster deeper connections with their customers, ultimately driving greater engagement and loyalty. As AI technology advances, its integration into customer interactions promises to revolutionize the way businesses understand and respond to their customers' emotional needs, creating a more empathetic and connected world.

Conclusion

In conclusion, the integration of automation and AI technologies into modern marketing strategies has profound implications for businesses seeking to enhance customer experiences in a globalized world. By leveraging AI-driven insights, companies can surpass geographical and cultural barriers to deliver personalized recommendations, analyse sentiment in real-time, predict consumer behaviour, and detect emotional cues. These AI-powered strategies enable businesses to tailor their offerings to diverse global audiences, foster cross-cultural understanding, and build deeper connections with worldwide clients. However, it’s essential for companies to prioritize transparency, privacy, and ethical considerations in their AI implementations to mitigate potential risks and ensure a trustworthy customer experience. As AI technology continues to evolve, its integration into marketing strategies promises to revolutionize the way businesses interact with customers, ultimately driving higher levels of satisfaction, engagement, and loyalty in an increasingly interconnected and dynamic marketplace. Ultimately, the key to maximizing the benefits of this

analysis lies in its integration with other customer feedback mechanisms and human judgment. While AI algorithms can provide valuable insights and predictions, human oversight and interpretation are essential for contextualizing the data and making informed decisions. As Alexandr Wang explores in his Ted Talk, by combining the strengths of AI with human expertise, businesses can create a more holistic approach to understanding and satisfying customer needs, ultimately driving higher levels of customer satisfaction and loyalty. Through empirical research and data analysis, businesses can harness the power of automation and AI to create more informed and persuasive marketing strategies that resonate with modern consumers and contribute to long-term success in the global economy.

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The Impact of Automation and AI on Modern Marketing Strategies

Sori Kubota

Introduction

We live in a rapidly changing world, with new developments and applications for artificial intelligence (AI) constantly opening up. Therefore, adapting to the increasing demands of automation and AI has become essential. Before delving into the applications of AI and automation in business, it is crucial to understand the definition and implications of each term.

Automation involves executing tasks with minimal human intervention. It is an advanced technology that operates through programmed commands combined with automatic feedback controls to ensure instructions are properly executed (Ekuma, 2024). AI can be defined as intelligent machines capable of tasks traditionally requiring human intelligence. AI merges the science and engineering that empowers computers and digital devices to learn, read, write, analyze and play (Walsh et al., 2019). The difference between AI and automation is that AI enables machines to simulate human thinking and behaviour, whereas automation simply mechanizes tasks that can be performed manually.

Marketing strategies have evolved from broad to highly customized and efficient methodologies in response to automation and AI. This technological shift has drastically changed how businesses interact with their customers. Marketing strategies based on big data help predict customer behaviour and provide insights that enable businesses to enhance overall customer experience (Kopalle et al., 2022). Many companies are using AI to improve customer experience. For example, all Fortune 1000 firms are actively investing in AI to ensure alignment with customer needs. According to data from Accenture, using AI will enhance corporate profitability by an average of 38% by 2035 (Purdy & Daugherty, 2017).

While these technologies have clear advantages, businesses should also be aware of their disadvantages, such as customer concerns about privacy infringement and ethical considerations (Hermann, 2022). This study examines how integrating AI and automation into marketing activities can improve service and enhance customer experience by developing personalized marketing strategies. It also assesses the implications of adopting these innovations, including how privacy infringements affect customers and how businesses can mitigate these concerns and address their ethical implications. This research offers comprehensive insights into both the potential benefits, and the ethical challenges posed by this technological shift, emphasizing the need to balance these aspects for effective implementation.

Introducing Automation & AI to Modern Marketing Strategies

Modern marketing strategies aim to enhance customer experience and improve engagement. This entails adopting a tailored marketing approach to match customers' requirements (Chintalapati & Pandey, 2022). Modern marketing tools, especially those powered by AI, can rapidly process and analyze large datasets, providing accurate insights to enhance marketing activities. Such insights, which may be overlooked by a human marketer, can help businesses create tailored marketing campaigns aligned with individual customer needs by accurately analyzing and predicting customer purchase patterns (Kopalle et al., 2022). Automated systems can also perform repetitive tasks, such as running email marketing campaigns, creating social media posts, and promptly handling customer queries without constant human oversight (Nair & Gupta, 2021). The use of AI and automation in routine business activities not only enhances operational efficiency but also significantly improves customer satisfaction ratings. Moreover, personalized marketing campaigns generated using AI algorithms substantially increase customer loyalty and conversion rates, and automation tools facilitate uninterrupted customer interactions through various touchpoints, ensuring a cohesive brand experience (Suryathi & Mariani, 2023). The dual approach of leveraging AI or strategic decision-making and automation to increase accuracy promotes highly effective modern marketing practices and gives businesses a competitive advantage.

How Businesses Leverage AI and Automation to Enhance Customer Experience

Enhancing Customer Experience Through Personalization

Automation and AI are cornerstones of modern marketing, particularly when used to enhance the customer experience. These technologies have transformed how businesses engage and interact with customers using personalized marketing campaigns (Khan & Iqbal, 2020). Reasons to embrace these technological changes include the ability of AI tools to create personalized marketing messages, automate email marketing and facilitate product recommendations that match customers' needs. This is achieved through analyzing extensive data on previous purchase patterns to understand customer engagement metrics (Sharakhina et al., 2023).

In terms of modern marketing, the best example of AI implementation is Amazon's recommendation system. Amazon's E-portals provide a customized and unique shopping experience for each customer by suggesting relevant products to meet their needs, enhancing the shopping experience and increasing customer loyalty. The use of AI in marketing can potentially drive improved sales and customer satisfaction simultaneously (Necula & Păvăloaia, 2023).

The effectiveness of this approach in contributing to Amazon's success is evident in the company's substantial investment in its recommendation engine, highlighting the significant impact of personalized marketing on consumer behaviour. This real-world example demonstrates that AI and automation can transform marketing strategies for businesses in the digital era allowing them to offer goods and services tailored to customer needs, resulting in an enhanced customer experience. Amazon's system illustrates how businesses can leverage technology to meet the evolving demands of consumers by adopting personalization in an e-commerce business.

Automation in Customer Service and Engagement

AI-powered tools, such as chatbots and virtual assistants, play a vital role in improving customer experience and increasing engagement as part of modern marketing strategies. These AI-powered tools can assist customers around the clock and respond to many basic queries, thereby improving customer experience and ultimately enhancing brand image (Roslan & Ahmad, 2023). Based on AI algorithms, chatbots provide human-like interactions using natural language. They can engage customers in meaningful conversations, resolve queries and support customers during purchasing decisions.

In the modern business world, the banking sector demonstrates the best implementation of chatbot technologies. Financial institutions offer basic customer service and provide personalized banking advice through these models. A notable example is Bank of America's virtual financial assistant, 'Erica', which provides more than 25 million users with personalized financial guidance based on predictive analytics using cognitive messaging. Erica provides insights into customers' finances, reminding them of bill payments and assisting with simple transactions via its conversational interface. This level of personalized interaction between the bank and its clients increases customer satisfaction and helps deepen the trust relationship between the client and the business.

Erica not only addresses customer queries but also gathers valuable data for a better understanding of customers' behaviours and preferences, giving marketers a significant strategic advantage. The information collected by chatbots and virtual assistants can subsequently be used to create personalized marketing strategies and targeted offers by analyzing customers' future needs, ultimately driving sales and fostering a robust and ongoing customer relationship (Mori & Du, 2023). Thus, using chatbots as part of customer service and engagement strategies increases customer satisfaction and improves business operations while significantly enhancing the overall customer experience.

Ethical Considerations in AI-Driven Marketing

Despite the significant potential for improved efficiency, integrating AI into marketing initiatives raises potential ethical concerns, particularly regarding the risk of infringing on customer privacy and misusing customer data. Ethical considerations revolve around consent, transparency and preserving the delicate balance between personalization and intrusion. To avoid ethical issues, it is essential to obtain customers' consent to collect and use their data (Kumar & Suthar, 2024). However, due to the complexity and opacity of AI algorithms, it is difficult to uphold the principle of informed consent during data collection and processing.

To maintain customer trust, businesses must be transparent about how they collect, store and process customer data. AI algorithms can make it difficult for companies to explain their data collection practices, which can negatively impact consumer confidence. A more complex ethical dilemma is balancing the optimal level of personalization versus the risk of intrusion, and the thin line between businesses being helpful and being invasive. The case of Spotify's 'Listening Together' campaign is a good example of a company on an ethical tightrope. Data collected from customers are used to create global connections and communities by highlighting instances in which two people play the same song simultaneously. However, this raises concerns regarding privacy and consent and how personal listening habits are shared as part of marketing efforts (Park & Kaneshiro, 2022).

Critics argue that such apps, despite their positive intentions, are also ethically questionable because they reveal users' moods, preferences and behaviours.

The above example provides insights into a modern marketer's broader challenges in terms of the ethical landscape and the implications of using AI-driven marketing strategies. Although companies engage more customers by using personalized content, the ability to ensure an ethical framework broadens the boundaries. Using AI marketing within an ethical framework requires a balanced approach to enhance the effectiveness of these tools in improving

customer experience while protecting consumer privacy. This can be achieved by ensuring transparency and guaranteeing that individual rights are not compromised, thus building trust (Aldboush & Ferdous, 2023). Adopting a balanced approach can help mitigate the associated risks, ultimately increasing customer experience, trust and support, which foster customer loyalty.

Consumer Privacy and Data Protection

The integration of AI and automation into traditional marketing activities has raised significant privacy and data protection concerns. These technologies can analyze vast amounts of personal data and influence customers' decision-making processes through customized marketing strategies. It is important to balance privacy and customer consent with data utilization to effectively address the challenges these technologies present. In this context, the European Union's General Data Protection Regulation (GDPR) plays an important role, offering a comprehensive framework for monitoring data collection, processing, and storage while ensuring complete transparency of information for the customer (Al-Fayad, 2020). Multinational technology-based companies are adopting these practices. One example of the successful implementation of the GDPR can be found at SAP, a German multinational software company. SAP has adapted its modern marketing strategy to the GDPR, updating its marketing practices to improve data management, processing and implementation. This ensures strict compliance with customer consent requirements while enabling personalized marketing (Mast, 2018). It is also crucial for consumers to demand transparency from companies regarding how data is used. As consumers, it is our duty to support companies that prioritize ethical practices and data protection. Therefore, we should educate ourselves about how AI uses our data and the implications of sharing personal information on the internet. Consumers can stay ahead of AI by using strong passwords, adjusting privacy settings and opting out of data collection whenever possible.

The retail industry has adopted GDPR guidelines to avoid losing customer trust and to maintain customer privacy when shifting from traditional marketing activities to advanced technology-based approaches. To reduce the risk of

privacy breaches, retailers have begun using anonymous data collection and compiling data to create customized marketing campaigns (Benzmann, 2021). Increasingly, they also utilize AI to automate compliance procedures, ensuring compliance with GDPR guidelines regarding data usage. This shift aligns with regulatory mandates, prioritizes privacy and boosts consumer satisfaction, experience, and brand loyalty (Kouroupis et al., 2021). These examples highlight the diversity of challenges and adaptations involved in implementing AI and automation in modern marketing. The GDPR focuses on protecting consumer privacy during this shift in the development and implementation of AI and automation technologies.

Navigating the Future of AI and Automation in Marketing

Companies are constantly exploring the potential of various aspects of AI-driven marketing strategies but struggle to balance innovation and ethical marketing practices. To address this challenge, companies have set up internal independent ethics committees to ensure strict regulatory compliance with the GDPR's guiding principles. According to Du and Xie (2021), these ethics committees are vital for developing and executing marketing strategies while aligning with societal values and consumer expectations in line with the GDPR. Adhering to these privacy laws not only reduces legal risks but also earns customer trust by demonstrating a commitment to maintaining customer privacy, thereby building brand loyalty. Companies can protect consumer rights and fulfil their ethical responsibilities by complying with the GDPR's ethical guidelines and regulatory standards.

The potential of AI and automation for marketing can be enhanced through the integration of emerging technologies like augmented reality (AR) and the Internet of Things (IoT). For example, AR can provide customers with a live experience, revolutionizing customer engagement, and IoT-based devices can help refine personalization (Wagner & Cozmiuc, 2022). These innovations enable the development of marketing strategies focused on customer interaction and consumer engagement, which strengthens relationships and boosts loyalty.

However, marketing strategies incorporating AI and automation will require a balanced approach that considers both innovation and ethical integrity (Ahmed, 2022). This commitment to compliance will safeguard customer trust and maintain brand loyalty in the digital era.

Conclusion

AI and automation have revolutionized the marketing industry, improving customer experience through personalized engagement and enhancing operational efficiency. Despite their benefits, these technological advancements pose ethical considerations and privacy risks that businesses must address to maintain customer trust. The use of customer data is essential in creating personalized marketing strategies. However, while acknowledging its benefits businesses must adopt a strict approach to obtaining customer consent, providing transparency and respect for customer privacy within the framework of regulations such as the GDPR. Companies that uphold these regulations can mitigate legal challenges through ethical practices and regulatory compliance, exemplifying innovative and ethical strategies in the current digital landscape. Regulators, policymakers, and investors must also understand the implications of AI and implement robust data protection laws to safeguard private information. Additionally, ethical guidelines focused on fairness and accountability should be established for deploying AI technologies. Regulators must enact laws governing the collection, storage and use of data by AI systems. Regular audits and frequent assessments of AI systems should be required. Policymakers can focus on raising public awareness through campaigns that highlight the implications of AI. Educating the public will contribute significantly to privacy protection and the overall success of AI systems. The integration of evolving technologies supported by AI algorithms, such as AR and IoT, is enabling more powerful and personalized customer experiences. However, ensuring their effectiveness relies on striking a balance between innovation and ethical considerations, providing the best possible service to customers while preserving their trust and loyalty.

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POLITICAL & DEVELOPMENT ECONOMICS SECTION

INTRODUCTION

Politics and the economy continuously inform one another: when something is beneficial to economic development, politicians tend to follow suit to enable it, and vice versa. Yet, with some topics such as AI, economists' arguments of improved efficiency may not be enough, as politicians also have to satisfy workers and the general public, who worry that AI may harm them and our society. As the IZA states, "AI systems generate winners and losers", and politics decides who becomes who. The virtues and flaws of AI and policy recommendations are addressed in the two featured essays.

In the UK, AI adoption was an important topic for the July 2024 government elections. While massive job losses were feared, it is agreed that AI is likely to grow GDP and improve the efficiency of government procedures according to Bloomberg (2024). IPPR research therefore procured scenarios of varying severity to show that the effect of AI is fickle and relies on regulating policy. In the elections, the ultimately victorious Labour Party supported intensified AI regulation, facing the opposing view of the Conservative Party, which wanted free innovation. The new Labour government aims to ensure that at-risk jobs can be adapted to include AI, not be replaced by it. Lower-skilled workers in the UK can

herefore expect more jobs, whereas law firms suspect that companies integrating AI will face more scrutiny.

The two essays take a more global approach and offer complementary perspectives: they utilise theoretical frameworks and empirical analysis to explore the dynamics between AI adoption and labour markets across different economies. The first article by Samreen Matiana investigates how AI-driven automation influences labour polarisation; Matiana delves into the role of labour markets in amplifying income disparities, particularly in advanced economies, where AI adoption is often associated with job displacement. Her article raises critical questions about the future of work and the role of education in equipping workers for an AI-dominated economy.

The second article, by Sardar Shehryar Khan, conducts a comparative analysis of AI's effect on income inequality between advanced and emerging economies. Using panel data from 12 countries, Khan shows that, while AI exacerbates inequality in advanced economies, it can potentially reduce inequality in emerging markets if managed properly. Both essays address the problem of income inequality, and, together, these works contribute to the growing discourse on how technological advancements like AI affect global economic structures and the working population.

Luca Olin Dzikowski & Nastasia Wittig
Perspectives Political & Development Economics Section Editors

Economic Impact of Automation and AI: Effects on Productivity, Jobs, and Income Distribution

Samreen Matiana

Introduction

Automation and Artificial Intelligence (AI) are two of the most powerful and transformative technologies of our time. They are rapidly changing the way industries operate all over the world, with the potential to increase efficiency, alter employment markets, and intensify income inequalities. AI involves creating systems that can perform tasks requiring human intelligence, such as decision-making and language understanding. Automation refers to using technology to perform tasks without human intervention. As these technologies continue to advance at an unprecedented rate, there is growing concern about their impact on society as a whole. In recent years, there have been many discussions about the broader socio-economic implications of these changes, including their effects on economic growth, productivity, employment opportunities, earnings, and inequality. By applying classical and modern economic theories, we can better understand and predict the impacts of these technologies, and work towards creating solutions that benefit everyone. To begin with, it is crucial to acknowledge and emphasise that productivity, job markets, and income distribution are not isolated factors, but are deeply interconnected. It has been established by foundational economics and current literature that these economic parameters are interdependent and there is considerable overlap between them. This essay adopts a qualitative approach to examine the current literature on this subject and synthesises the overall impact of AI and automation on these interconnected parameters.

Productivity

Classical economists have long credited technological progress for its role in

economic growth. These theories collectively assert that technological innovation is a crucial driver of economic prosperity. Solow's (1957) theory of economic growth, also known as the Solow Growth Model, emphasises the significance of technological innovation in driving long-term economic growth and productivity. According to this theory, while capital accumulation can lead to initial increases in output, sustained economic growth is primarily the result of technological progress. Solow's model introduced the concept of steady-state growth and highlighted the importance of technology in escaping diminishing returns to capital. This theory stresses the idea that improvements in productivity, rather than increases in labour or capital, are crucial for long-term economic development. Romer (1990) further emphasised the role of human capital and knowledge in growth, indicating that technological innovations contribute to increased output and enhance the productivity of existing resources. Aghion and Howitt (1992) built on this concept by introducing the idea of creative destruction, where new technologies supersede outdated ones. By constantly innovating, economies can improve efficiency, create new industries, and enhance overall productivity.

Despite the optimistic predictions about the beneficial impacts of technological change on productivity, the reality has been different. Advanced economies have experienced dormant productivity growth since the 1970s, even in sectors heavily investing in digital technologies (Gordon, 2018). A number of critics also offer perspectives that reduce enthusiasm for technological advances. Gordon (2018) contends that the productivity plateau is a permanent feature of the economy, suggesting that the transformative impact of recent innovations, including AI, may not match the revolutionary changes of past technologies like electricity. Jones's (2009) research on innovation's increasing complexity and collaborative nature suggests that breakthroughs are becoming more challenging, potentially explaining the stagnation in productivity growth. These counterarguments challenge the straightforward applicability of classical economic theories in explaining the outcomes of recent technological innovations, sparking a need for further exploration and understanding.

However, empirical research supports the classical economist view. In a recent study by Damioli et al. (2021), the effect of AI and robotics on labour productivity was analysed across 5,257 international corporations that had submitted AI patents from 2000 to 2016. Using a unique dataset combining patent applications data from the Worldwide Patent Statistical Database with financial information from the Bureau Van Dijk's ORBIS database, the study shows that AI patent applications positively and significantly impact labour productivity, with SMEs and the service sector showing the most significant gains. However, larger firms and the manufacturing sector show less impact, suggesting that these entities already benefit from diverse non-AI innovations. This study implies that firm size is an indicator of the correlation between AI and productivity. It also suggests that the full potential of AI may gradually unfold. This study provides valuable insights into the impact of AI on labour productivity, however, it only focuses on firms that have filed AI patents, which introduces selection bias. The study also does not examine AI's broader economic and social consequences, such as job displacement and wage inequality. As previously mentioned, these factors are intertwined and may act as confounding variables that could hinder or exacerbate the effects of AI. Therefore, while the study provides important information, it is essential to consider other factors in future studies to obtain a more holistic view of AI's impact on productivity. Applying this small-scale study globally is difficult, but it does begin to provide insights into the relationship between technology and productivity, which is predominantly shown to be positive despite some concerns.

Labour Markets

The dynamics of modern-day technological advancements, particularly in AI and automation, present challenges concerning the labour market. According to Au-Yong-Oliveira (2019), the contemporary labour market can be broadly classified into three primary categories: high-wage, high-education jobs, encompassing professions such as engineers, programmers, and doctors; middle-class jobs, typified by operative positions; and low-skill, low-education jobs, including cleaning services or home health aides. The theory of skill-biased technological

change, which highlights the potential downside of technological advancements, suggests that these may exacerbate wage polarisation (Autor et al., 2013) and inequality by disproportionately increasing demand for high-skilled labour (Josten & Lordan, 2020), resulting in job losses due to automation. Conversely, middle-skill jobs are diminishing, and given the rise of automation, individuals with excessive qualifications may find themselves competing for a limited number of positions. The development of automation technology indicates that automation is expanding beyond repetitive tasks to more complex activities. Frey & Osborne (2013) classify occupations by their risk of computerisation, noting that high-skill roles are less likely to be automated than low-skill jobs, which are more susceptible due to their repetitive and predictable nature. This stresses the need for individuals to improve their education and expertise to remain competitive in the job market. Furthermore, when we consider the impact of automation and AI on a global scale, we see that it is an even more complicated issue that affects developed and developing nations differently. In developed countries, automation and AI can help fill gaps in the labour market and maintain productivity levels. When we apply the skillset hypothesis to the developing world, we can see that automation and AI have the potential to be highly disruptive. This is because they can replace jobs that are classified as low or medium-skilled, which in turn can threaten the livelihoods of millions of people. Furthermore, this could also lead to an increase in the gap between different socio-economic classes.

However, on a business level, scholars argue that automation cannot replace the complex contributions of human workers, making it a valuable tool to any organisation and not a complete job market controller. Autor (2015) justified this positive outlook in two ways. The 'O-ring' and 'Never-get-enough' principles highlight the critical value of human labour and our innate drive for innovation. To conceptualise the O-ring principle, Au-Yong-Oliveira (2019) uses the case of Automated Teller Machines (ATMs) as an example. While they initially streamlined cash transactions, they also created new job opportunities by reallocating tellers to more fulfilling roles. Similarly, we can learn from historical examples, such as the First Industrial Revolution, which showed that while

innovation can eliminate jobs, it can also create new and often better opportunities. Automation highlights tasks that require human intervention, reminding us of the evolving nature of work. The Never-get-enough principle fuels a constant demand for new ideas and technologies, driving innovation and creating new job categories beyond mere machine operation. The interplay between human creativity and technological progress creates a dynamic labour market, generating new possibilities and affirming the enduring significance of human work in the digital age.

Based on the existing literature, the impact of automation and AI on job opportunities depends on workers' skill sets. It is widely accepted that to effectively integrate artificial intelligence with our skills, we need to enhance our ability to work collaboratively with it. By prioritising the development of our skills, we not only prepare ourselves for the future of work but also enrich the job market. Upskilling can unlock a multitude of opportunities and help us maintain our competitiveness in a constantly evolving job market.

Income Distribution

In 1930, economist John Maynard Keynes wrote "Economic Possibilities for our Grandchildren". In it, he explored how technological progress could enhance people's standard of living in the future. Nevertheless, he also raised concerns about the impact of excessive free time on society. Keynes believed these obstacles would have an impact on everyone. However, a more recent paper by Korinek et al. (2017) states that technological innovation may result in a few individuals amassing great wealth, while most regular workers could experience substantially lower wages compared comparatively.

Many countries are grappling with a shrinking workforce or an ageing population and are turning to robots, AI, and automated machinery to address this problem. However, as previously discussed, this solution exacerbates income inequality by changing job roles and disproportionately affecting low and medium-skill positions. Goyal and Aneja (2020) prove this is especially true

in India's developing economy, where automation has caused a 2.8% reduction in low-skill jobs and a 1.11% reduction in medium-skill jobs. While these figures seem relatively low, we must consider that for a country with India's population low and medium-skill workers constitute a sizeable group. Furthermore, this study is consistent with Korinek's hypothesis. They find that there is a connection between AI and automation, and the increase in income inequality. The study highlights that technological progress, especially in AI, has disproportionately impacted workers based on their skill levels. This trend is particularly concerning in countries like India, where many people are illiterate and unemployed. This shift is responsible for the widening income gap, which is more pronounced in developing countries than in developed ones.

Korinek et al. (2017) uses a hypothetical first-best economy to prove that redistribution is necessary to reap the benefits of AI and automation. They assert that the spread of AI and other forms of worker-replacing technological change can be unambiguously positive in a first-best economy in which individuals are fully insured against any adverse effects of innovation or if it is coupled with the proper form of redistribution. With the right insurance and redistribution policies in place, AI and other technological advancements can positively impact the economy. However, without proper intervention, these changes could lead to a decrease in worker income and overall well-being. This is highly likely as we see changes in factor prices offering an opportunity for redistribution and the potential for Pareto improvements. However, resistance to innovation may arise if there are limits on redistribution. To achieve and maximise Pareto improvements, Korinek et al. recommends a range of second-best policies, such as changes in intellectual property rights.

Automation is enhancing income inequality, especially in developing countries. Strategic interventions are required to mitigate its negative impact on job markets and income distribution. Education and skills training must be enhanced, workers need to be prepared for changing job market demands, and policies must be implemented to protect vulnerable populations from the adverse effects of technological progress.

Conclusion

In summary, the rise of automation and AI presents opportunities and obstacles for future productivity, job markets, and income equality. Developed countries may benefit without significant employment decreases, but developing nations may experience higher unemployment rates and income inequality. Cooperation between policymakers, educators, and industry leaders is crucial to maximising the benefits of automation and AI while minimising negative impacts. This requires investment in education and skills development, a focus on employee well-being, and policies that prioritise redistribution. By embracing the potential of these technologies, we can create a prosperous future where we can fully and sustainably capitalise on the benefits of AI.

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How Does Artificial Intelligence Impact Income Inequality: A Case of Advanced and Emerging Economies

Sardar Shehryar Khan

Introduction

The COVID-19 pandemic has impacted Artificial Intelligence (AI) usage: an Appen's State of AI and Machine Learning report shows a 41% acceleration in the use of AI across businesses in 2020. While this does provide a positive outlook of increased GDP, through increased productivity, its effect on income inequality remains a cause for concern. Many economists consider the effects of AI on income inequality but not within the specific context of comparing its effects between countries with different economic backgrounds. This essay seeks to address the effect of AI on income inequality within advanced and emerging countries using the definition presented by the IMF, which uses factors such as GDP per capita to classify countries. Panel Data consisting of the share of income distribution and private AI investments from 2010 to 2020 for six advanced and six emerging economies are used to answer this question through a fixed effects regression. The results are then analyzed, and some general guidelines to policymakers are presented to allow them to reap the benefits of AI while keeping income inequality in check. This essay will use the OECD's (2019) definition of AI: "a machine-based system that can, for a given set of human-defined objectives, make predictions, recommendations, or decisions influencing real or virtual environments".

Literature Review

Because the impact of technological advancements on the economy takes a long time to show, the effect of AI on income inequality is unclear at present (Unger and Brynjolfsson 2023). Economists take opposing sides regarding this matter.

On the pessimistic side, AI can cause job polarization by removing routine tasks involving labor, which lowers the wages of lesser skilled workers and increases demand for higher skilled work, leading to greater income inequality (Szczepański, M. 2019). Even job fields requiring cognitive skills such as marketing are now at risk due to recent developments in generative AI such as Chat-GPT, which can produce content on demand (Unger and Brynjolfsson 2023). On the optimistic side, AI has the potential to support less skilled workers by being a helpful tool that enhances efficiency (Barrow and Davenport 2019). In the customer service industry, a recent survey of 5000 workers shows that AI implemented to support lesser skilled workers boosted their productivity (Unger and Brynjolfsson 2023).

AI's effect on income inequality depends on the level of exposure and complementarity of the labor force to AI. Advanced economies have more such jobs than emerging economies. (Cazzaniga et al. 2024, p.9). These findings present a complex path that inequality can take. For advanced economies, due to greater exposure, workers face a higher chance of job displacement and hence higher levels of income inequality. However, they are also in a place where they can have an early advantage through utilizing growth opportunities (Ibid, p.9). In emerging economies, due to the scarcity of AI, there may be increased income inequality through increased marginal use of AI by a select few holding the innovation rents (Korinek and Stiglitz 2017, p.18). However, if the adoption of AI is handled properly, it can reduce income inequality by boosting productivity and facilitating education, which could help reduce the literacy gap (Nilekani and Bhojwani 2023).

The factors presented above highlight the uncertainty of AI's effect on income inequality, and also underscore the importance of identifying this effect. Consequently, the next section aims to use quantitative analysis to address these concerns.

The Methodology

Panel data consisting of six advanced and six emerging countries (see Appendix) is chosen according to the IMF's criteria (World Economic Outlook 2023). A word of caution is advised with respect to the selected emerging economies because Russia and China are included, which may not be representative of the other countries in this group. Data from 2010 to 2020 on the yearly distribution of post-tax income after benefits is collected for each country (World Bank Poverty and Inequality Platform 2024). The top 10% represents the share of the income held by the richest 10% of the population. The middle 40% and the bottom 50% represent the share held by the 10th to 50th and 50th to 100th percentile of the population respectively. This is regressed against annual investments in AI in billions of USD for each country in the ten-year period (Center for Security and Emerging Technology 2023). Data on GDP growth, unemployment rate, and inflation rate is taken from the World Bank to be used as controls. The data is summarized below:

Variable	Obs	Mean	Std. Dev.	Min	Max
Income Top 10%	66	26.525	2.297	22.992	31.082
Income Middle 40%	66	46.877	1.175	44.535	49.393
Income Bottom 50%	66	26.598	2.871	21.298	30.281
Investments ($Billions)	65	6.419	18.356	.001	101.794
GDP Growth	66	2.318	4.141	-10.36	24.475
Unemployment Rate	66	7.092	2.868	3.67	15.45
Inflation Rate	66	1.324	1.059	-.922	3.856

Figure 1: Descriptive Statistics for Advanced Economics

(Note: Data on Austria's investment in 2011 is unavailable)

Variable	Obs	Mean	Std. Dev.	Min	Max
Income Top 10%	65	29.902	5.827	22.76	42.474
Income Middle 40%	65	45.387	1.702	41.496	47.005
Income Bottom 50%	65	24.711	4.335	15.683	30.747
Investments ($Billions)	61	1.122	3.524	0	18.382
GDP Growth	66	2.777	3.266	-4.536	10.636
Unemployment Rate	66	7.142	2.951	3.16	13.7
Inflation Rate	66	3.44	2.823	-1.418	15.534

Figure 2: Descriptive Statistics for Emerging Economics

(Note: Data on Hungary's investment from 2010-2012, Brazil's investment in 2011, Brazil's income distribution in 2010, and Bulgaria's investment in 2020 is unavailable)

The following fixed effects regression is run:

$$IncomeShare_{it} = \beta_0 + \beta_1 Investments_{it} + \beta_2 GDPGrowth_{it} + \beta_3 Unemployment_{it} + \beta_4 Inflation_{it} + u_{it} + \alpha_i$$

$$H_0 : \beta_1 = 0$$
$$H_A : B_1 \neq 1$$

GDP growth is included as a control for the overall growth of an economy. The unemployment rate is used to account for the changes in the labor market. Inflation is used to adjust for rising prices. Furthermore, post-tax income shares allow the regression to factor in tax policies in each country. The null hypothesis above states that private investments in AI have no effect on each of the respective income shares. The alternate hypothesis states that AI investments influence income distribution. The model aims to study the unbiased effect of AI on inequality.

Regression Results

The regression results are displayed in the figures below:

VARIABLES	(1) Top 10%	(2) Middle 40%	(3) Bottom 50%
Investments	0.00750**	-0.00272	-0.00478**
	(0.00234)	(0.00231)	(0.00177)
GDP Growth	0.0445	-0.0310**	-0.0135
	(0.0265)	(0.0114)	(0.0166)
Unemployment Rate	0.0957	0.0357	-0.131*
	(0.0658)	(0.0610)	(0.0583)
Inflation Rate	0.316**	-0.121*	-0.194
	(0.110)	(0.0473)	(0.0972)
Constant	25.33***	46.86***	27.81***
	(0.605)	(0.429)	(0.478)
Observations	65	65	65
R-squared	0.313	0.202	0.408
Number of Countries	6	6	6

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure 3: Regression Results for Advanced Economies

VARIABLES	(1) Top 10%	(2) Middle 40%	(3) Bottom 50%
Investments	-0.0624** (0.0185)	-0.0363*** (0.00720)	0.0987*** (0.0201)
GDP Growth	0.226** (0.0693)	0.00361 (0.0253)	-0.230** (0.0744)
Unemployment Rate	-0.0684 (0.232)	0.117 (0.0876)	-0.0489 (0.148)
Inflation Rate	0.0419 (0.0874)	0.0359 (0.0267)	-0.0778 (0.0771)
Constant	29.74*** (1.910)	44.50*** (0.678)	25.76*** (1.277)
Observations	60	60	60
R-squared	0.227	0.235	0.370
Number of Countries	6	6	6

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure 4: Regression Results for Emerging Economies

In advanced economies, for the top 10%, the coefficient of 0.0075 implies that on average if investments in AI increase by one billion dollars, the income share held by the richest 10% would increase by 0.0075%. This is also significant at the 5% level, indicating that the null hypothesis stating that AI investments do not influence income distributions can be rejected. For the middle 40%, the coefficient is -0.00272, indicating a negative relationship between AI investments and income share. This is insignificant at the 10% level. Lastly, for the bottom 50% there is a negative relationship between AI and income share as seen by the coefficient of 0.00478, which is significant at the 5% level. These results show that AI has contributed to higher income inequality in advanced economies by increasing the share of the top 10%, while reducing the income share held by the middle 40% and bottom 50%.

In emerging economies, for the top 10%, when investments in AI go up by one billion the income share on average goes down by 0.0624%. For the middle 40%, when investments go up by one billion, the income share on average decreases by 0.0363%. For the bottom 50%, when investments go up by one billion, the income share on average increases by 0.0987%. All these results are significant at the 5% level meaning that the null hypothesis of no influence of AI on income share can be rejected. Putting these results together, it can be concluded that AI has helped reduce overall income inequality in emerging economies by reducing the share of the top 10% and increasing the share of the bottom 50%. It has, however, also led to a decrease in the share of the middle 40%.

Overall, given the larger coefficients in emerging economies, it can be concluded that AI has had a much larger impact on reducing income inequality in emerging economies whereas in advanced economies it has had a smaller effect in exacerbating it.

The analysis presented also has its shortcomings. The time period of the data is from 2010 to 2020, which is unable to account for developments post 2022, when the world has shifted to a post COVID state, and more developments in technology such as generative AI have been seen. More specific control variables such as foreign direct investments could be included to account for external investments in infrastructure and reduce omitted variable bias. Given that the analysis has used clustered standard errors, there may also be an issue of inflated test statistics. Lastly, there are five less observations in the emerging economies regression. While this may introduce potential bias into the comparative results, the small difference in the number of missing values suggests that the conclusion will not be significantly affected.

Implications and Conclusion

The findings presented above imply that while AI has a mixed effect on income inequality in emerging economies, it may be used as a powerful tool to combat income inequality. This can be done through making the lower class more

efficient and productive. An example is that of India where, in November 2022, an app supporting auto-rickshaw drivers was launched, which has facilitated the arrangement of approximately 900 000 rides a day (Nilekani and Bhojwani 2023). Furthermore, investments in digital infrastructure can assist in the extraction of benefits from AI adoption resulting in the removal of pressure from other government departments such as healthcare (Cazzaniga et al. 2024). For example, in the medical sector, AI can be used as a virtual assistant to address customer queries and concerns (Chen and Esmaeilzadeh 2024, p. 4). This can help governments to address other challenges such as income inequality better.

For advanced economies, even if the analysis shows that AI has contributed to higher income inequality, proper navigation of AI adoption can prove helpful in mitigating its impact. Taxation policies can have a significant impact on the redistribution of income from richer to poorer groups. A recent study at MIT shows that a modest tax of 1% to 3.7% on robots that replace jobs can help to fight income inequality in the US (Dizikes 2022). Universal basic income can also help with income inequality by giving a baseline income to each person regardless of status; however, there are cons to this approach including the tremendous cost of shouldering this policy, which would require a 50% income tax increase in the US (Furman and Seamans 2019, p. 181).

Education policies are also essential to reduce income inequality in both emerging and advanced economies. With AI causing a shift in the skills required in the labor market, the integration of technical skills into education curriculums will allow countries to close the digital gap and reduce the imbalances AI may cause in the labor market (Cornelli et al. p. 22). Providing incentives through research grants will encourage the move to fields which are highly compatible with AI, such as computer science, resulting in a reduction in job polarization. This is already being seen in the United States with there being a jump of 4.2% from 2020 to 2021 in Computer Science PhD students specializing in AI (Maslej et al. 2023, p.244).

To conclude the discussion, this essay has attempted to explain the effect of AI on income inequality in advanced and emerging economies respectively. Firstly, theoretical viewpoints of economists regarding the effect of AI on income inequality were considered. Then, the essay transitioned to a fixed effects regression of income distribution on private investments in AI from 2010-2020 for six advanced and six emerging countries respectively. The results showed that AI has a mixed effect on income inequality in emerging countries as while it increases the share of the bottom 50%, it decreases the share of the middle 40% alongside the top 10%. In advanced economies, AI has increased income inequality by increasing the share of the top 10% and decreasing the share of the middle 40% and bottom 50%. Finally, these results were used to provide helpful guidance to policy makers in countries with different economic backgrounds to navigate the AI revolution effectively.

Appendix

Advanced Economies: Austria, France, Ireland, Israel, United Kingdom, United States.

Emerging Economies: Brazil, Bulgaria, China, Hungary, Poland, Russia.

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