

THE INFLUENCE OF ADOPTING ARTIFICIAL INTELLIGENCE (AI) ON MALAYSIA'S ECONOMIC ENVIRONMENT.

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Date Received: 15 November 2023 | Date Reviewed: 10 February 2024

Date Accepted: 12 March 2024 | Date Published: 30 June 2024

DOI: <https://10.51200/mjbe.v11i1.5294>

ABSTRACT

This study aims to conduct a systematic review of the implications of adopting Artificial Intelligence (AI) on the economic landscape of Malaysia. Aligned with economic growth theories, the research underscores AI's pivotal role in transforming resources characterized by diminishing marginal returns into assets with increasing marginal returns. The analysis is multifaceted, addressing three fundamental perspectives. First, it examines AI adoption's impact on both microeconomic and macroeconomic dimensions. At the macroeconomic level, the study observes AI's influence on demand-pull and cost-push inflation, affecting overall price levels in the Malaysian economy. At the microeconomic level, AI adoption is linked to increased productivity and efficient resource allocation, leading to economies of scale. In an innovative and competitive business environment, AI adoption further enhances the quality of goods and services while ensuring competitive pricing strategies. Second, the study differentiates the positive and negative consequences of AI adoption across various sectors and demographic groups, providing specific examples of how different industries and population segments may benefit from or face challenges due to AI implementation. Finally, the analysis distinguishes the short-term and long-term impacts of AI adoption. In the short term, changes in employment, productivity, and consumer prices are identified, while the long-term analysis explores structural changes, including income redistribution and sustained productivity growth. The findings highlight the net positive impact of AI adoption in Malaysia, emphasizing that its benefits outweigh the costs. The study underscores the significance of government involvement in formulating policies and providing necessary infrastructure, aligning with Romer's theory of economic growth to drive successful and sustainable AI adoption for economic development.

Keywords: artificial intelligence, economic landscape, Malaysia, microeconomics, macroeconomics.

INTRODUCTION

It is no secret that artificial intelligence (AI) is rapidly changing the world as we know it. The development of technology that mimics human intelligence is having a profound impact on the way we live and work (Burns et al., 2023). One area where AI is significantly impacting is the global economy. Across the globe, businesses are integrating AI into their operations, and this trend is only set to continue in the future. In fact, according to PwC, AI is expected to contribute up to US\$15.7 trillion to the global economy by 2030. This staggering sum highlights the scale of AI's economic impact (PwC, 2017).

One of the primary reasons AI has such a substantial impact on the economy is its ability to automate tasks that have historically required human workers, particularly in manufacturing, where robots can take over much of the production line and increase efficiency. This leads to significant cost savings for businesses, allowing them to invest more money in other areas. There is strong empirical evidence that the adoption of AI has reduced the demand for labor as well as the cost of running a business significantly, which can be elaborated from various economic perspectives.

First, the automation of tasks: AI and robotic process automation have made it possible to automate a wide range of tasks previously performed by human workers. This has led to a reduction in the demand for labor in industries such as manufacturing, logistics, and customer service. For instance, Amazon has implemented robots in their warehouses to transport and package products (Gills et al., 2014). This has significantly reduced the time taken to complete tasks and has allowed the company to process more orders without hiring additional workers, thus benefiting from large-scale production. The average cost for each unit of products produced has been reduced significantly, indicating that the company is experiencing economies of scale. According to PwC (2019), almost 20% of enterprises wanted to deploy AI in 2019, but by 2020, 90% agreed that it offered opportunities, with only 4% feeling the need to deploy it. AI automates everything from driving for the elderly to scanning the smallest tumors in medical science (McClellan, 2020).

Second, AI promotes efficiency: AI systems can process large amounts of data and perform tasks much faster than human workers, improving economic efficiency and productivity, which translates to cost savings for businesses. IBM's AI system Watson, for example, can analyze large amounts of medical data and provide medical professionals with actionable insights, helping them diagnose and treat patients more efficiently. Economic efficiency is achieved because companies can produce more output with minimal input in the production process.

Third, AI has predictive analytics capabilities: AI-powered predictive analytics can help businesses make better decisions and reduce costs. By analyzing data, machine learning algorithms can predict outcomes and identify potential problems before they occur, allowing businesses to take preventative measures. Predictive maintenance systems, for instance, can identify when equipment is likely to fail and recommend maintenance or repair before it breaks down, helping businesses avoid costly downtime and repair expenses.

Fourth, AI provides excellent customer service, adding value to products: AI-powered chatbots and virtual assistants can provide automated customer support, reducing the demand for human customer service representatives. This not only reduces labor costs but also provides a faster and more personalized experience for customers. Capital One's chatbot Eno, for example, helps

customers with account-related queries, saving the company time and resources in handling customer queries (Goldstein & Chi, 2022). Empirical evidence suggests that AI has led to a reduction in the demand for labor and the cost of running a business. While this may create challenges for workers, the benefits of AI in terms of increased efficiency, productivity, and cost savings for businesses are difficult to ignore.

In addition to reducing costs through economies of scale, AI has also helped expand businesses. Another key way AI impacts the economy is through the creation of new industries and markets. As AI technology becomes more advanced, it is opening up new possibilities and creating new opportunities for entrepreneurs and businesses. One area already seeing significant growth is the development of AI-driven healthcare solutions, which have the potential to revolutionize the industry. This growth has increased market share, which can result in an increase in monopoly power for businesses.

Despite the many benefits of AI, there are also concerns about its impact on human jobs. As AI becomes more prevalent, many jobs currently done by humans could become automated, leading to significant job losses in some industries and sectors. However, it is worth noting that AI is likely to create many new jobs, particularly in areas such as data science and machine learning.

In conclusion, the impact of AI on the economy is already significant and is set to become even greater in the years to come. While there are challenges to be addressed, there is no denying the transformative power of AI. As businesses embrace this technology and invest in its development, AI will continue to shape and reshape the global economy in profound ways.

PROBLEM STATEMENT

Malaysia, like many other countries, faces significant issues and challenges in adopting Artificial Intelligence (AI) from an economic perspective. There are several empirical evidence-based challenges related to the development of AI.

First, there is a lack of awareness and infrastructure to support the adoption of AI in businesses. According to the Malaysia Digital Economy Corporation (MDEC) (2022), 68% of Malaysian businesses have not yet implemented or set up any plans for AI. This indicates a lack of awareness and readiness among businesses to adopt AI. Additionally, the lack of infrastructure in terms of training, research, and development to support AI implementation in the country is a significant challenge (South East Asia Digital Content Industry Talent Report, 2022).

Second, there is a skills gap. The lack of skilled labor is another issue Malaysia faces in the adoption of AI. According to the World Economic Forum (WEF), Malaysia ranks 83rd out of 130 countries in terms of digital skills (World Economic Forum, May 15, 2023). This highlights the need for upskilling and reskilling the current workforce to meet the demands of an AI-driven economy.

Third, AI is strongly associated with privacy and security concerns. Malaysia faces several challenges regarding data privacy and security, which could hinder AI adoption. The Personal Data Protection Act (PDPA) limits the use of personal data in AI, making it difficult for businesses to implement AI-powered solutions that rely on personal data.

Fourth, implementing AI-based production involves high costs. Implementing AI technology requires a significant investment in infrastructure and technology, posing a challenge for Malaysian businesses, especially small and medium-sized enterprises (SMEs) with limited financial resources. Fifth, there is the potential for economic disruption. The adoption of AI could lead to economic disruption in the Malaysian economy. Many jobs, particularly those involving repetitive tasks, may become obsolete, leading to unemployment and a widening income gap, creating challenges for social inclusion.

Addressing these challenges is a major concern for businesses. Therefore, this study aims to investigate the progress in confronting these challenges from various approaches, such as dimensions (microeconomics versus macroeconomics), positive versus negative impacts, and duration (short-term versus long-term impacts) from an economic landscape perspective.

RESEARCH OBJECTIVE

The overall research objective was to evaluate the impact of the booming AI on businesses from an economic perspective. The specific research objectives of the studies were as follows:

- a. To discuss the impact of AI growth from the perspectives of microeconomics and macroeconomics in Malaysia.
- b. To distinguish between the positive and negative impacts of AI growth in Malaysia.
- c. To evaluate the impact of duration (short term and long term) on AI growth in Malaysia.

LITERATURE REVIEW

The confluence of contributions by Adam Smith, David Ricardo, and Robert Malthus during the 18th and 19th centuries posits that every economy inherently maintains a consistent GDP steady state. Any deviation from this equilibrium is considered transient, with the system naturally readjusting to the steady state—a concept contemporarily recognized as the sustainability of growth. Economic growth, denoting the augmentation of goods and services within an economy, is synonymous with heightened productivity. As GDP expands, so does the population, disrupting the economy's long-term growth trajectory away from its stable state or sustainability. The expanding population exerts heightened demands on finite resources, thereby triggering a reduction in available resources. This scarcity subsequently diminishes the population size, leading to a contraction in GDP growth until it reverts to the steady state. Conversely, if GDP falls below the steady state, a decline in population occurs, resulting in reduced resource demands. This prompts GDP to ascend back to its sustainable growth level. Consequently, it can be inferred that the classical economic concept of the steady state aligns with the contemporary understanding of the sustainable level of economic growth within a nation.

The two famous economists who developed the neoclassical theory were T.W. Swan and Robert Solow. They developed the Solow-Swan Growth Model. The growth theory focuses on three factors of production: capital, labor, and technology. The growth per unit of labor is known as output per labor, and the growth per unit of capital is known as output per capital. Output per labor increases with output per capital but at a diminishing marginal return. It will reach a point where labor and capital will experience an equilibrium state. Since a nation can theoretically determine the amount of labor and capital needed to reach an equilibrium state, technological advances are what drive economic growth. When technological advances take place, then the

amount of labor and capital needed to achieve growth needs to be adjusted. It is also suggested that if all countries have the same amount of technological advances, then we would experience the same level of economic growth. The standard of living would also be the same. The weaknesses in the model lie in explaining technological advances and the diminishing marginal returns of capital and labor.

As for the endogenous growth model, the diminishing marginal returns can be reverted to increasing marginal returns in the long run. There are increasing returns to scale when labor is given education and training. This can improve the quality of labor and increase productivity. Governments should enact policies to create new entrepreneurs, which can help create new jobs and businesses. Investment should be directed to improve infrastructure and manufacturing processes that encourage innovation. Intellectual property rights such as copyright and patents are incentives for businesses to expand their operations.

Within the framework of the endogenous growth model, prominent models include the AK Arrow Model, Uzawa-Lucas Model, and Romer Model, all of which underscore the paramount significance of technology. The AK Arrow Model, also recognized as the learning by doing model, posits that economic transformations can occur through innovation and technology. It elucidates how self-practice and innovation contribute to enhanced productivity and improved human capital, ensuring the efficient use of labor to generate one unit of output.

The Uzawa-Lucas Model serves as an economic growth model elucidating the rise in GDP per capita over time. Central to this model is the premise that technological progress, embodied in the knowledge and skills of the workforce, propels economic growth. The model identifies two primary drivers of economic growth: capital accumulation, encompassing physical capital growth like infrastructure and machinery, and human capital accumulation, referring to the augmentation of workforce knowledge and skills.

According to the Uzawa-Lucas Model, nations with high levels of human capital accumulation are poised for accelerated economic growth. This is attributed to the adeptness of a skilled workforce in adapting to technological changes, thereby fostering higher productivity and increased output. The model also posits that economic growth may decelerate over time as capital and human capital levels approach their maximum thresholds—a phenomenon known as diminishing returns to capital. In essence, the Uzawa-Lucas Model furnishes a theoretical framework for comprehending the interplay between capital accumulation, human capital accumulation, and economic growth, serving as a cornerstone in empirical research on economic growth.

Moreover, according to the Romer model, knowledge is considered a non-rival good, indicating that the generation and utilization of knowledge by one individual or company do not diminish its accessibility for others. This signifies that the creation of knowledge carries positive externalities, underscoring the significance for governments to offer incentives that foster knowledge creation and dissemination to foster economic growth. In summary, the Romer model has played a significant role in influencing policy dialogues regarding the pivotal role of human capital and innovation in fostering sustained long-term economic growth.

METHODOLOGY

A systematic review was conducted on the impact of AI on businesses in Malaysia. The analysis commences with a discussion on several approaches to dividing the discussion regarding the impact of AI from an economic perspective. In this study, three possible approaches were utilized:

a. **Macroeconomic vs. microeconomic impact:** One way to divide the discussion is to focus on the different levels of impact that AI can have on the economy. Macroeconomic impact refers to the effects of AI on the overall performance of the economy, such as GDP, inflation, employment, and productivity. Microeconomic impact, on the other hand, pertains to the effects of AI on individual firms, industries, and consumers, such as changes in production processes, market structure, and consumer behavior.

There are three major issues associated with utilizing AI and robots in businesses: cost, trust, and job displacement. Since the initial investment cost for AI is high, the impact of AI may not be linear but may grow at an accelerating rate over time. This is in line with the S-curve pattern of AI adoption, which begins slowly with substantial costs and investments associated with learning and deploying these technologies. However, the acceleration must be accompanied by a cumulative effect of competition and an improvement in complementary capabilities. It takes time for productivity to unfold, aligning with the Solow Paradox.

b. **Positive vs. negative impact.** Another way to divide the discussion is to distinguish between the positive and negative effects of AI on the economy. Positive impacts of AI might include increased efficiency, lower costs, and higher innovation, while negative impacts might encompass the displacement of workers, higher inequality, and lack of privacy. This approach could also consider the trade-offs between the positive and negative impacts, and how they might vary across different sectors, regions, or groups of people.

c. **Short-term vs. long-term impact.** A third way to divide the discussion is to examine the temporal dimension of the impact of AI on the economy. Short-term impacts might include the initial adoption and diffusion of AI technologies, as well as the immediate effects on employment and productivity. Long-term impacts, on the other hand, might encompass the transformation of entire industries and the emergence of new ones, as well as changes in social norms, institutions, and values that could accompany the AI revolution. This approach could also explore the uncertainties and risks associated with the long-term impacts, such as the potential for unintended consequences or systemic failures.

Finally, the study synthesizes the findings to provide a comprehensive discussion on the impact of AI on businesses. It will identify the barriers to the adoption of AI in order to maximize the benefits of AI while minimizing its negative impacts.

FINDINGS

The development of AI can be analysed based on macroeconomic and microeconomic impact..

Macroeconomic impacts.

a. **Inflation.** Traditional economic theory posits various determinants of inflation. Monetarists claim that an increase in the money supply can elevate the inflation rate. Conversely, Keynesian theory emphasizes that increases in consumer expenditure,

government spending, trade surpluses, and investments can stimulate demand for goods and services, creating excess demand and resulting in demand-pull inflation. However, some researchers perceive that AI can enhance business efficiency, reducing costs and boosting productivity, potentially leading to a decrease in inflation. Moreover, AI can facilitate job automation, reducing employment opportunities and dampening consumer spending, thereby potentially decreasing inflation or causing disinflation.

Financial technology (fintech) adds value to the development of financial markets. Following the 2008 financial crisis, many firms shifted from financial markets to entrepreneurship. The rise of crowdfunding, mobile apps, cryptocurrencies, and financial payment systems has increased investment, injecting capital into the economy and bolstering purchasing power. Simultaneously, fintech can stimulate demand for goods and services through increased consumer spending, acting as an injection into the economy and potentially driving demand-pull inflation. Barro (1997) also emphasizes that AI accelerates transaction speed. According to Fisher's quantity theory of money, an increase in the velocity of money results in a rise in the general price level, known as inflation. Numerous empirical studies support the direct influence of fintech on purchasing power, attributed to its convenience in transactions, checking account balances, and performing fund transfers (Taherdoost, 2018).

b. Interest Rates. Interest rates can have both positive and negative impacts on macroeconomic fundamentals with the development of AI. The positive impact occurs when AI is introduced via fintech, enabling financial institutions to process vast amounts of data, identify trends, and make predictions more accurately and quickly. This can decrease uncertainty in financial markets, leading to more stable interest rates. Simultaneously, AI through fintech facilitates the mobilization of funds, making it easier for financial market participants to access capital. This reduces information costs within the financial system, resulting in increased demand and supply for funds and stabilizing interest rates.

Conversely, interest rates can also have a negative impact on the economy. With the development of AI, there is a possibility of inflation. In response to inflation, governments often implement contractionary monetary policies. These policies increase interest rates, thereby raising the cost of borrowing money.

c. Employment. While AI can lead to increased automation of jobs, it can also create new opportunities in fields such as data analysis, software development, and machine learning. Additionally, the increased efficiency and productivity generated by AI can contribute to overall economic growth, resulting in increased employment opportunities. The nature of employment has undergone transformation with the advent of AI, leading to a higher demand for knowledge-based AI workers. However, this may also lead to unemployment among graduates who lack the necessary skills and knowledge demanded by the job market.

Currently, Malaysia is ranked 43rd in the world for unemployment, with a rate of 3.73% in 2022 (Statista, 2023). Despite this, Malaysia is facing a shortage of labor in certain

industries, particularly in agriculture and manufacturing. The Federation of Manufacturing Malaysia (2022) has reported a shortage of 600,000 workers. In 2022, approximately 1.6 million applications were received for foreign labor due to the shortage, despite the manufacturing and restaurant sectors offering attractive salary packages. However, due to social status considerations, many Malaysians are hesitant to work in these sectors (New Straits Times, February 13, 2023). The demand for AI-based knowledge and skilled labor may increase wages that firms need to pay, potentially leading to wage inflation or cost-push inflation.

The shortage of labor has been attributed to documentation problems from source countries, which are time-consuming. Additionally, the shortage is exacerbated by the lack of interest among locals and vocational graduates who do not meet the demands of businesses. Some employees who lost their jobs have transitioned to the gig economy and show little interest in returning to the formal work environment, preferring the autonomy of being self-employed (New Straits Times, February 13, 2023). Despite claims of job loss due to the introduction of robots, the reality may be more nuanced. The introduction of robots can benefit sectors facing serious labor shortages, increasing production efficiency and reducing uncertainty in the production process.

d. Exchange Rate. Artificial neural networks have recently been widely used in the field of finance, including exchange rate prediction. Since exchange rates and gold prices are crucial for financial institutions, accurate estimation of these values is vital for the stock market and businesses alike. Güler and Tepecik (2019) utilized monthly data from 2006 to 2018 and incorporated independent variables such as the BIST 100 Index, US inflation rate, Turkish inflation rate, US interest rate, and Turkish interest rate to forecast the exchange rate between the US and Turkey. Similarly, they estimated the gold exchange rate using variables like the BIST 100 index data, silver and gold prices, US and Turkish inflation rates, and US and Turkish interest rates. Artificial neural networks provided accurate forecasting results for both the exchange rate and the gold exchange rate, enabling predictions of future financial crises. The integration of AI in international trade and finance can enhance efficiency and accuracy, leading to more stable exchange rates. Furthermore, AI can facilitate the adoption of cryptocurrencies and other digital currencies, which may also influence exchange rates.

e. Gross Domestic Product (GDP). The integration of AI in businesses promises enhanced efficiency, productivity, and innovation, thereby fostering overall economic growth. Moreover, the development and implementation of AI systems and infrastructure can generate new job opportunities and stimulate investment, further bolstering GDP growth. Projections suggest that by 2025, the adoption of AI could lead to a potential GDP increase of up to 26%, primarily driven by productivity gains (Economic Planning Unit, 2022).

However, from a corporate perspective, the adoption of AI technology can lead to a dualistic outcome. While frontrunners in AI adoption may significantly increase their cash flow and economic benefits within 5 to 7 years, after accounting for transition and investment costs, slower adopters or non-adopters may lag behind. By 2030, those firms

not embracing AI technology are forecasted to experience a substantial 20% decline in cash flow (Economic Planning Unit, 2022). Therefore, the primary drivers of AI adoption and its pace are competitive dynamics within industries. Firms are motivated to adopt AI to compete with frontrunners and gain a competitive advantage, potentially shifting market share in their favor.

Microeconomic Impacts.

AI technology is already exerting a significant impact on microeconomics in Malaysia, and as its adoption continues to expand, further changes and transformations in business operations and economic performance can be expected. These changes span productivity, competitiveness, innovation, and entrepreneurship.

a. Productivity. AI technology can enhance firm productivity by streamlining time-consuming activities. According to the Center of Public Policy, the adoption of AI has led to a productivity increase from 0.6% to 1.2% in the service sector, with an anticipated 30% increase in the manufacturing sector by 2030 (The Edge Malaysia, 19 May 2023). Improved productivity, achieved with minimal inputs, translates to higher profits, enabling firms to grow through increased investments. These investments, in turn, elevate the net worth of the firm, driving demand for its stock and consequently raising stock prices, thereby facilitating future growth opportunities.

b. Competitiveness. AI can empower Malaysian businesses to gain a competitive advantage by enhancing efficiency and delivering superior customer experiences. According to a PwC survey conducted in 2017, 75% of Malaysian CEOs regard AI as a strategic priority for their business, with over 40% already using AI or planning to do so within the next three years.

c. Innovation. AI contributes to fostering innovation by improving efficiency and enhancing customer experiences. As per a PwC survey from 2017, 75% of Malaysian CEOs consider AI a strategic priority for their business, with over 40% already utilizing AI or intending to do so within the next three years.

d. Entrepreneurship. AI is paving the way for new entrepreneurial opportunities by enabling the emergence of AI-powered start-ups. According to a study by Start-up Genome in 2022, Kuala Lumpur ranks among the top 40 start-ups ecosystems globally, with a growing presence of AI start-ups and investors.

The overall positive and the negative impact of AI based on sectors and groups of people.

Artificial Intelligence (AI) entails the development of computer systems capable of performing tasks typically necessitating human intelligence, including perception, reasoning, and decision-making. Its utilization has proliferated across various sectors and industries in recent years. While AI technology offers numerous benefits, it also poses potential negative impacts that can vary across sectors, companies, and different groups of people. From an economic standpoint, assessing the costs and benefits of AI technology is crucial to better understand its potential impact.

Positive impacts of AI technology can be examined from various perspectives. Firstly, it enhances efficiency and productivity. By automating tasks previously done manually, AI aids businesses in boosting efficiency and productivity. For instance, in the manufacturing sector, AI-powered robots can handle repetitive tasks like assembly line work, enabling human workers to focus on more complex tasks. This can result in increased outputs and reduced costs per unit, ultimately driving greater profitability.

Secondly, AI technology increases accuracy and precision. Machine learning algorithms utilized in AI fine-tune processes and enhance the accuracy and precision of outputs. This improves quality control in manufacturing and distribution, leading to fewer defects and returns, thereby enhancing customer satisfaction. Thirdly, AI facilitates faster decision-making. By leveraging big data and machine learning algorithms, AI enables businesses to make faster and more informed decisions. Through the analysis of large data sets, AI identifies patterns and predicts outcomes, aiding businesses in making accurate and effective decisions.

Conversely, negative impacts of AI include job displacement. Automation of tasks by AI poses a risk of displacing human jobs. While AI creates new job opportunities in fields such as data analysis and AI development, these jobs may necessitate a different set of skills and qualifications from those displaced by automation, resulting in a skills gap. This necessitates retraining efforts, increasing costs for both governments at the macro level and firms at the micro level. Secondly, there are concerns regarding data privacy and security. AI relies on vast amounts of data to operate effectively, raising concerns about privacy and security. As AI technology advances, there is a risk of misuse or hacking of sensitive personal information.

Lastly, bias and discrimination are potential negative impacts of AI. Machine learning algorithms are susceptible to bias if trained on biased data, leading to unfair or discriminatory outcomes. This can adversely affect individuals and communities unfairly impacted by biased algorithms.

In conclusion, while AI technology offers significant benefits to businesses and society by enhancing efficiency, accuracy, and decision-making, it also presents potential negative impacts such as job displacement, data privacy concerns, and bias and discrimination. Policymakers and businesses must carefully assess the costs and benefits of AI technology to maximize its benefits while mitigating potential negative impacts.

The impact of AI development based on sectors.

Artificial Intelligence (AI) is an emerging technology in Malaysia, with increasing use across various sectors. Here are some of the positive and negative impacts of AI in different sectors in Malaysia.

a. Health Sector.

The positive impact of AI in the health sector. AI-powered systems such as chatbots, telemedicine, and symptom checkers are being used to improve access to healthcare services and diagnosis in Malaysia. According to a survey conducted by Telenor Group (2021), 53% of Malaysians stated that they are willing to use chatbots and other digital health tools to access healthcare services. In contrast, the use of AI may also lead to medical errors if AI-powered systems are not calibrated properly. In 2021, a report by the American Medical Association

highlighted the risk of bias and errors in AI healthcare systems, which could lead to misdiagnosis and incorrect treatment. (Natalia Norori et al., 2021)

b. Education Sector.

AI technology can help personalize learning for students in Malaysia. For example, AI-powered learning systems can adapt to the learning style and pace of individual students, providing tailored learning experiences. According to a report by Hoot suite and We Are Social (2022), 74% of Malaysians believe that online learning is an effective way to improve their skills. Adversely, the use of AI in education could lead to job displacement for educators and support staff. According to a report from the World Economic Forum (2023), up to 50% of teachers' work in Malaysia could be automated by 2030.

c. Retail Sector

AI-powered systems such as chatbots and personalized recommendations can improve the customer experience. According to a report by McKinsey & Company, personalizing the customer experience with AI-powered recommendation engines can lead to a 1-5% increase in revenue for retailers in Malaysia. Unfortunately, the use of AI in retail could lead to job displacement for retail workers. McKinsey & Company's report also states that up to 47% of retail jobs in Malaysia could be automated by 2030. (Julien Bousset, Brian Gregg, Kathryn Rathjie, Eli Stein & Kai Volhardt, July 18, 2019)

d. Finance Sector.

AI technology can help improve fraud detection and risk assessment in the financial sector. According to a report by Accenture, AI-powered systems can reduce the risk of fraud by up to 40% and improve risk assessment accuracy by up to 90%. But the use of AI in finance could lead to job displacement for finance workers. Accenture's report also states that up to 31% of finance jobs in Malaysia could be automated by 2030. (Hannah Unkefer, 2017)

While the use of AI technology can bring significant benefits to different sectors in Malaysia, such as improved efficiency and productivity, there are also potential negative impacts such as job displacement and the risk of errors or bias. Policymakers and businesses need to carefully assess the costs and benefits of AI technology in specific sectors to ensure that its use maximizes the benefits and minimizes the negative impacts.

The impact of AI based on the group of people.

Artificial Intelligence (AI) technology also has the potential to impact different groups of people in Malaysia in unique ways. Here are some examples of the positive and negative impacts of AI technology based on different groups of people in Malaysia.

a. Workers

AI technology can help improve the productivity and efficiency of workers in Malaysia. According to a report by Accenture, by 2035, AI could add up to MYR 155 billion to Malaysia's annual GDP and increase labor productivity by up to 30%. (Hannah Unkefer, June 21, 2019) But the use of AI in industries such as manufacturing, retail, and finance could lead to job displacement for workers. According to a report by the World Economic Forum (2023) up to 54% of jobs in Malaysia are susceptible to automation by 2025.

b. Consumers

AI-powered systems can improve the customer experience for consumers in Malaysia. For example, chatbots and personalized recommendations can help consumers find the products and services they need more easily. According to a survey conducted by PwC (2017), 89% of consumers in Malaysia are willing to share their data with companies in exchange for personalized experiences. In contrast, the use of AI could lead to privacy concerns and a lack of transparency. Consumers may be unsure of how their data is being used and whether it is being protected. According to the 2020 Data Protection Survey by the Centre for Governance, Institutions and Organisations, 67% of Malaysians are concerned about how their personal data is being used. (Ipsos, March 18, 2018).

c. Elderly

AI-powered systems can be used to improve healthcare services for elderly people in Malaysia. For example, AI-powered wearable devices can monitor vital signs and alert healthcare providers in case of an emergency. According to a survey conducted by Telenor Group, 56% of elderly people in Malaysia would be willing to use digital health tools to manage their health. But the use of AI in elderly care may lead to concerns about data privacy and a lack of human interaction. Some elderly people may prefer human caregivers to AI-powered systems. (Natalia Norori et al., 2021).

While the use of AI technology can bring significant benefits to different groups of people in Malaysia, such as improved productivity and customer experiences, there are also potential negative impacts such as job displacement and privacy concerns. Policymakers and businesses need to carefully assess the costs and benefits of AI technology for specific groups of people in order to maximize its positive impacts and minimize the negative ones.

Short term versus long term impact with the development of AI.

Several studies and reports shed light on the potential impacts of AI on the Malaysian economy in both the short run and the long run.

In the short term, AI-powered automation can boost productivity by reducing manual tasks and expediting processes, leading to cost savings and enhanced efficiency across industries such as agriculture, manufacturing, and logistics. Additionally, AI creates new job opportunities even as it displaces low-skilled labor, particularly in industries like call centers and manufacturing. Finally, it fosters competitiveness, offering significant advantages to early adopters over their counterparts.

Looking at the long-term effects, AI has the potential to narrow the income gap, particularly addressing the middle-income trap. By facilitating higher productivity, advanced manufacturing, and innovation across sectors, AI could propel Malaysia beyond its middle-income status. However, it also poses challenges related to inclusion and inequality. Concentrated adoption among large firms or industries could exacerbate economic inequality, creating a digital divide between those with access to AI and those without. This is because larger firms typically have the resources to invest in R&D, driving long-term growth, innovation, and foreign investment in the country.

Overall, while the adoption of AI holds significant long-term benefits for Malaysia's economy, careful planning and strategic investment are imperative to address potential negative impacts and ensure equitable distribution of AI's benefits across society. (Refer to Table 1)

Table 1 shows the summary on the impact of AI on Malaysia.

Impact of AI adoption in Malaysia	Positive Impact.	Negative Impact
Inflation rate	Economic growth through injection, disinflation	Demand-pull inflation Cost-push inflation
Interest rate	Reduces the cost of borrowing money due to digital currency	Increase in interest to curb inflation. Increases cost of borrowing money.
Employment	Transformation in the type of labour. Higher skills and pay	Increases cost of labour. Job displacement.
Exchange rate	Better prediction on the exchange rate and the gold exchange rate.	None.
GDP	Productivity Increases. Production efficiency.	Dualism in the economy is where you have front runners and the slow or no adopters.
Microeconomics		
Productivity	Increases.	None
Cost of production	Economics of scale	Initial high cost for the infrastructure.
Competition	Quality goods with competitive prices. No price discrimination.	Competition destroys the business if not equipped.
Innovation	Competitive advantage	None
Entrepreneurship	Increase the number of entrepreneurs	None
Sectors.	Manufacturing, health, finance, agriculture and service sectors.	
Group of people	All age groups.	
Short term	Productivity, Increased efficiency, high skill labour and competitiveness	High cost of the infrastructure
Long term	Productivity, eradicating middle-income trap, investment and R&D.	

CONCLUSION

As we enter the era of AI, assured economic growth is substantiated by various economists through their theories on economic growth. The indispensability of technology is emphasized, and its synergy with human resources and capital is crucial. Both human resources and capital exhibit diminishing marginal returns with increased utilization, necessitating the integration of technology for sustained increasing marginal returns. The advent of AI significantly influences the fundamental macroeconomic aspects, dynamically impacting local economies heavily reliant on trade and foreign direct investment. The introduction of AI introduces external influences to the domestic economy, altering GDP, inflation rates, interest rates, employment, and exchange rates.

In response, Malaysia must exhibit resilience at the micro level to adapt to these changes. Failure to adapt can lead to uncertainty, risks, reduced competitiveness, and job displacement. However, a proactive approach can effectively address these issues over time, facilitating a smooth transition and minimizing the short-term and long-term adverse effects of adopting AI. Despite acknowledging the challenges, the positive net benefits of AI adoption outweigh the costs, making it imperative for businesses to strategically incorporate artificial intelligence. The effectiveness of this adoption relies on the institution, with the Malaysian government playing a pivotal role in crafting appropriate policies and infrastructure, aligning with Romer's theory of economic growth.

Malaysia is one of Southeast Asia's fastest-growing economies and has made some strides in developing its AI capabilities. However, there are several economic barriers the country is facing that may hinder its progress toward full AI development. Some of the key challenges are as follows:

1. Lack of awareness and understanding. A lack of awareness or understanding of AI's potential is a primary barrier to adoption in Malaysia. According to a 2018 survey by Microsoft, only 29% of small and medium-sized businesses in Malaysia have adopted AI technologies, with 62% of businesses unaware of technologies that could help them.
2. Insufficient infrastructure. Limited infrastructure, including data storage and processing capability, restricts the development and deployment of AI systems in Malaysia. Data privacy regulations also create complications in collecting, managing, and sharing data.
3. Scarce funding and investment. Despite the government's efforts to promote the adoption of AI, Malaysian businesses and start-ups still face difficulty receiving funding and investment for AI development. As per a Deloitte report, Malaysia's investment in R&D for AI is negligible compared to other countries like Singapore, South Korea, and China.
4. Shortage of AI experts: The insufficient supply of skilled AI professionals is another challenge that Malaysia faces. The country has relatively few qualified data scientists or machine learning experts to help companies implement sophisticated AI solutions.
5. Regulatory issues: The absence of a standardized regulatory framework makes it difficult to evaluate and benchmark technology among industry players, hampering AI's adoption.

Addressing these challenges will be key to Malaysia's development of a competitive and sustainable AI industry. The government's initiatives to increase awareness, invest in infrastructure and R&D, and introduce a regulatory framework can help to alleviate these concerns and improve Malaysia's AI readiness.

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