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## Artificial Intelligence and its Potential Adverse Impacts on the Philippine Economy

Recent developments in artificial intelligence (AI) and deep learning techniques are expected to reshape the nature of the working environment in many economic sectors through the automation of many white collar jobs. This technological breakthrough poses threats of job obsolescence in several industries, particularly for a labor-abundant country such as the Philippines. With human capital as one of its largest resources, the services sector is a major contributor to the country's economy, contributing around 60% of the total gross domestic product and employing about 22.8 million workers (Philippine Statistics Authority, 2017).

In the past, economic models have predicted that jobs of routine nature were at the greatest risk of being affected by AI. On the other hand, non-routine jobs that require interaction are seen as being potentially enhanced by AI technologies (Autor, Levy, & Murnane, 2003). It was estimated that 47% of the jobs in the United States were at the risk of automation (Frey & Osborne, 2017). This prediction may also hold true in the business process outsourcing (BPO) industry in the Philippines. The Philippines is one of the popular destinations for BPO firms. High labor costs have pushed firms in developed countries such as USA, Europe, and Australia to offshore some parts of their operations in the labor considered to be "offshorable" (Blinder, 2009). BPO firms serve jobs that are not location-specific and do not require face-to-face communication. This sector has grown to an economically significant scale in less than two decades. In 2016, the information technology and business process management sector employed 1.15 million people and contributed PhP254.90 billion to PhP563.58 billion (IT and Business Processing Association of the Philippines, 2017). The English language proficiency and accent neutrality of Filipinos

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provide a strong advantage for employers in contact centers. Advances in speech and natural language processing, and computer vision, now allow machines to automatically transcribe spoken language to text (or speech recognition), comprehend human language (or natural language understanding), translate text written in one natural language to another (or machine translation), and artificially produce human speech (or speech synthesis), recognize emotions from speech and visual information, and identify objects in images (or image recognition). Moreover, these technologies are easily accessible through various cloud-based solutions such as Google Cloud, Amazon Lex, and IBM Watson. Deep learning techniques have enabled machines to perform perceptive tasks that are comparable to, or even surpass human abilities, given sufficient training data which can now be more conveniently harnessed and distributed via the world wide web (Hof, 2017). Internet of Things (IOT) has made technology more ubiquitous and allowed for easy and periodic access to personalized data. These technological advances expose BPO firms to the risks of computerization. Only tasks that entail creative and social skills cannot be automated by near-term technologies (Frey & Osborne, 2017). To stay relevant amidst automation, we have to address the skills gap for more specialized aspects of BPO, such as IT services, healthcare, and shared services. This would potentially reduce AI threats (Errighi, Bodwell, & Khatiwada, 2016).

With the Philippine government's recent approval of the 2017 Investment Priorities Plan (IPP), industries are expected to scale up and disperse among provinces. This would drive creative industries and knowledge-based services, which cover the information technology and business process management services and digital start-

ups, to branch out across the country (Board of Investments, 2017).

Automation may be viewed as a threat as it has a negative impact on employment such as job displacement and reduction in investments. However, it may also provide opportunities for new jobs arising from automation and it may improve productivity. For example, outside of Metro Manila, where there are only a number of skilled professionals, AI may be a welcome development to address the shortage in skilled labor. A town with only three accounting firms cannot handle the tax returns of all the firms. With AI, the three accounting firms may be able to address the needs of all the small businesses by automating some of their processes for encoding data to produce the necessary forms required for renewing licenses and permits, as well as to generate financial statements. Although it is arguable that BPO firms need not have a physical presence in some locations, training and monitoring of the proper use of the technology by the businesses should be implemented on a regular basis to ensure the integrity of the data encoded.

AI may be more correctly defined as "Augmented Intelligence" as it does not necessarily eliminate the human input to production. In fact, it actually complements human input. Its contribution to various fields such as healthcare, social services, education, financial services, transportation, public safety infrastructure, and the environment have been identified (IBM, 2017). Since productivity in developed countries are slowly tapering off, the emergence of AI will introduce the much-needed stimulus for renewed growth (Arntz, Gregory, & Zierahn, 2016). Harnessing the benefits of AI in boosting productivity and efficiency is the key towards achieving higher returns to labor.

There is a need to develop industries that may benefit from the rise of AI. To achieve antifragility, challenges are posed to the government and the education sector. First and foremost, the digital infrastructure, particularly internet connectivity, that support data-intensive businesses should be upgraded, and made more secure and competitively affordable. Policymakers should encourage the expansion towards AI-augmented business opportunities such as the use of big data for planning, establish the field of business intelligence, and upgrade workforce skills to complement and keep up with emerging technologies. There is evidence that the risk may not be as high as anticipated if a job-level approach is undertaken instead of an occupational-level analysis (Arntz, Gregory, & Zierahn, 2017). Nonetheless, adjustments must be made and these will require strong technical background, which means that it becomes imperative for the labor force to re-tool and focus on taking advantage of the technology and building non-automatable skills. On the other hand, the education sector must be able to scan the environment and develop programs in preparation for the next digital revolution. The public and private sector must work together in order to achieve a common goal of exploiting the benefits of AI while designing regulations to ensure public safety (Executive Office of the President National Science and Technology Council, 2016). With a large human capital base, the Philippines should be able to take advantage of the benefits through its workforce. The Philippines has lagged behind the ASEAN region. The possibility of increasing productivity through AI gives us a chance to catch up, and restores the prospect of gaining competitiveness within the region as ASEAN integration progresses.

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