IMPACTS OF HUMAN CAPITAL, THE FOURTH INDUSTRIAL REVOLUTION, AND INSTITUTIONAL QUALITY ON UNEMPLOYMENT: AN EMPIRICAL STUDY AT ASIAN COUNTRIES

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ABSTRACT

By using the combination of several regression techniques on panel data, this study explores the influence of human capital, institutional quality, and the Fourth Industrial Revolution on unemployment rates in 46 Asian countries during the period from 2007 to 2020. According to the generalized method of moments (GMM), there are a total of 9 factors affecting the unemployment rate in the researched model, including high-tech exports, inflation, population, gross domestic product, government spending, foreign debt, foreign direct investment, human capital, and institutions. This result confirmed that high-tech development increases unemployment in Asia; however, the nexus between human capital and institutional situation with the unemployment rate is different based on the particular fields. Moreover, some policy implications also have been suggested to reduce unemployment in Asian countries in the context of the Fourth Industrial Revolution.

Keywords: unemployment; human capital; nstitutional quality; the Fourth Industrial Revolution; Asian countries

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INTRODUCTION

nstitutional stability is a pre-requisite for economic growth and crucial for establishing a nation with sound footing (Shah et al., 2020). In the first decade of the 21st century, the 2009 Worldwide Governance Indicators (WGI) announced dimensions of governance, including: voice and accountability; political stability and absence of violence/ terrorism; government effectiveness; regulatory quality; rule of law; and control of corruption. Among these dimensions, Asia tends to be negative in all aspects except for

of government effectiveness and voice and accountability. Countries like China, Japan, and India seem to be better, but compared to the rest of the world, they still perform poorly. Wtihout improving these aspects, Asia will hardly be able to call itself the top region in the world.

In recent decades, however, Asia has experienced continuous economic leaps and bounds, increasing its global competitiveness. Since the end of the 20th century, most Asian countries have ceased warfare and started rebuilding. Asian countries account for more than 59.77% of the world's population and Asia is the largest continent of Earth. With the advantage of an abundant and low-cost labor force, Asia has attracted a lot of foreign investment capital from developed countries. Simultaneously, along with the industrial revolution, the application of modern technological equipment to the production and exploitation model of natural resources has made Asia more developed. The 2019 annual report of the International Monetary Fund (IMF) showed that Asia has achieved the highest nominal GDP in the world.

In recent years, the demand for human capital, especially qualified human resources, has been increasing along with the continuous development and integration of the global economy. In addition, the world has gone through three industrial revolutions and is entering the era of the Fourth Industrial Revolution (4IR). The remarkable advances of 4IR are posing countries, especially developing countries in Asia, with requirements for high-quality human resources to adapt to and catch up with global trends. In that context, Balog and Demidova (2021) argued that high-quality human capital is becoming a key factor in increasing the competitiveness of individual enterprises and national economies as a whole. In the long run, increased investment in human capital will contribute to increased technological innovation (Hu, 2021). One important factors that impacts unemployment is institutional quality. Sahnoun and Abdennadher (2019) stated that government effectiveness and political stability can help decrease unemployment by reducing the size of the underground economy, while Raifu (2021) believed that institutions have an indirect effect on reducing unemployment. Studies have proven that institutional quality, human capital, and technology complement each other, contributing to boosting the economy; however, as technology increasingly replaces workers in production, unemployment will increase (Ho and Tan, 2008). Will workers still have jobs in the context of 4IR? Does improving the quality of human capital as well as institutions help countries solve the unemployment problem? Those are the questions that the authors are interested in trying to find answers to, since the high unemployment rate will likely significantly impact social life as well as the global economy. Unemployment has been a dilemma issue in Asia, wherein it is a top concern for countries' stability and economic development policies. This study examined the role of human capital and institutional quality in solving the unemployment problem in the context of 4IR. It also explored the factors affecting unemployment in Asian countries over the period of time from 2007 to 2020. Finally, policy implications to reduce the unemployment rates in these countries were addressed.

LITERATURE REVIEW

The concept of human capital can be defined and approached in several different ways. From the beginning of economic theory, the work of W. Petty and A. Smith discussed ideas about the importance of human capital, in which investments in human capital were directly or indirectly linked to the importance of education. According to Becker (2009), the two most recognizable ways to invest in human capital are education and job training. Many studies have proven that highly educated people have a better chance of finding a job and are less likely to be unemployed. Krueger and Lindahl (2001) summarized and attempted to collate evidence from microeconometric and empirical foundations on macroeconomic growth about the impact of schooling on income and GDP growth. The results showed that at a national level, increases in educational attainment are unrelated to economic growth; however, as education levels get higher, the average income per year will increase by 5-15%. Higashi (2002) analyzed how the firm-specific use of human capital affects the unemployment rate. Their research suggested that if enterprise-specific human capital becomes more important and accumulates more quickly, the unemployment rate will decrease. Their findings also showed

that the higher the rate of technology obsolescence, the higher the unemployment rate. Moock et al. (2003) studied the impact of education level on income growth in Vietnam from 1992 to 1993. The study used employees' income as the dependent variable, and the independent variables included primary, secondary academic, secondary vocational, and university education. Their results indicated that education level impacts income, and this effect varies by region and gender. Accordingly, the impact of education level on income is stronger for the state sector than for the private sector, and for women, this effect is even stronge, with a higher unemployment rate for women than for men. Similarly, research by Hoti (2004), Eita and Ashipala (2010), and Cairó and Cajner (2016) also suggested that people with higher education levels will face a lower unemployment rate. Ho and Tan (2008) found that there is a threshold level for human capital in Singapore. When the human capital level of the economy is below the threshold, companies will take advantage of labor availability by making better use of technology where human capital can act as a complement to technology. As technology becomes increasingly capable of replacing labor, however, businesses will find that replacing labor with technology leads to higher labor productivity. As a result, when human capital crosses the threshold, the unemployment rate rises.

Given the strong development of technology due to the influence of 4IR, many studies have been conducted to examine its impact on countries' unemployment rates. Mincer and Danninger (2000) explored the response of unemployment differentials to the skills-biased change in demand due to new technologies, with variables such as unemployment rate, inflation rate, unskilled unemployment rate, research and development costs, and computer equipment. Their results showed that technology has ambiguous effects on total unemployment in the short term, but is likely to decline in the longer term. Hedvičáková and Král (2018) examined how the automation of Industry 4.0 in the Czech Republic affected the unemployment rate over the period from 2014 to 2018. The paper analyzed the unemployment rate in individual regions and the development of wages to provide an overview of the impact of Industry 4.0 and Works 4.0 on the labor market. The results suggested that the industrial revolution will have negative effects on unemployment, but that it will be over a long period and if there is education reform, the labor market will be prepared for these changes. Sozinova (2019) studied the causality of the formation of Industry 4.0 from the perspective of the global economy from 2000 to 2016. Specifically, the author considered the impact of high-tech exports, number of patents, number of researchers, and level of population covered by higher education on unemployment. The findings confirmed that high-tech exports represent Industry 4.0, reducing the global unemployment rate. Gaponenkoa and Glenn (2020) studied employment issues, labor, and unemployment in the Technology Industry 4.0. Their article outlined the issue of mutual influence on the development of Industry 4.0. and the transformation of the employment system. Global scenarios were designed to explore the dynamics and actions necessary for a smooth transition to new technologies and work patterns. The article also focused on key measures that can form the core of national strategies. According to the author, the issue of "technology 4.0 and jobs" is relatively new and multidisciplinary. As such, studying it in the long term, taking into account the dynamics of the external environment and the actions of the stakeholders, depends on the policies and the coordination of interests of the main parties. The foundation of sustainability is the development of self-organizing adaptive networks, increased international and inter-institutional cooperation, and the participation of all parties in policy formulation and monitoring policy implementation.

Several other studies examined the role of institutions in unemployment. Sahnoun and Abdennadher (2019) analyzed the relationship between the unemployment rate and the shadow economy in developed and developing countries from 2000 to 2015. Using the GMM estimator and related institutional variables, including political stability, governance effectiveness, and corruption, their research results stated that governments in developed and developing countries operate effectively through governance in terms of policy and political stability, leading to the reduction of the unemployment rate. Still, government corruption exists and has a strong impact, increasing the unemployment rate of countries. Raifu (2021) examined the role of institutional

quality in the link between oil price and unemployment in oil-exporting African and Asian countries during the 1991 – 2019 period. The study used methods such as OLS and ARDL, as well as variables such as corruption, bureaucratic quality, rule of law, democratic accountability and government stability, oil price, GDP, consumer price index, FDI, secondary school enrollment, and unemployment rate. The results found that institutions have an indirect effect on reducing unemployment in Asian oil exporting countries .

In addition to the above factors, studies have also demonstrated the impact of economic factors on unemployment. Maqbool et al. (2013) revealed that GDP, population, inflation, and foreign direct investment are significant determinants of unemployment in Pakistan in both the short-run and the long-run. Applying the error correction model (ECM) to a Nigerian context, Ogbeide et al. (2015) found that output size (measured by GDP), foreign direct investment, trade openness, and inflation reduce unemployment, while government expenditure aggravate unemployment. Cahyadin and Ratwianingsih (2020) explored the relationship between external debt and unemployment in 4 Asian countries over the years 1980-2017.

In general, there are quite a few studies on the factors affecting unemployment rates, with many different approaches. The above-mentioned studies have some limitations, such as a narrow research scope or the data has not being updated. In particular, there has been no research examining the simultaneous impact of three factors of human capital, 4IR, and institutional quality on unemployment, especially in Asia. These studies also encountered limitations in their use of available predictive methods and models from previous studies. Moreover, they used data with missing values, which led to low accuracy of the results, meaning the estimated results were not accurate and reliability was not high.

To fill the research gap, this study focuses on the impact of economic issues on unemployment with an almost complete addition of data for Asian countries. The paper uses the balanced panel dataset and the GMM estimation method to overcome problems of endogeneity so that the estimation results can be effective.

DATA AND METHODOLOGY

To study the impact of factors on unemployment in Asian countries, the authors used the unemployment rate (UN), measured as the number of unemployed people as a percentage of the labor force, as the dependent variable.

The independent variables in the model include:

Human capital: The usual standard for measuring human capital is mainly divided into three approaches: output, cost, and income. School enrollment rates, academic outcomes, adult literacy, and average years of schooling are examples of output-based approaches. The cost-based approach relies on the calculation of the cost of acquiring knowledge, while the income-based approach is tied to the individual benefits resulting from investment in education and training (Kwon, 2009). Given the above approaches and the availability of data, this study uses variables for human capital based on access to formal education. Specifically, the variables representing formal education include primary completion rate (HC1), secondary completion rate (HC2), and tertiary completion rate (HC3). These were also the measurements used in the studies of Connelly and Zheng (2003), Zhang and Zhuang (2011), and Sehrawat and Giri (2014).

4IR: According to Sozinova (2018), combined with available data, the study uses the value of high-tech exports in US dollars to represent the 4IR variable.

Institutional quality: based on Sahnoun and Abdennadher (2019), the governance effectiveness (GE) and political stability (PS) variables are used to measure institutional quality.

In addition, there are many other economic factors that affect the unemployment rate. As such, these factors were added to the model as control variables. Based on theories and reviews of previous studies, control variables including inflation, population size, GDP, external debt, government spending, trade openness, foreign direct investment, and total investment were used.

Table 1 shows the measurement and data collection methods of variables.

Table 1: Description of variables in the research model

Sign	Variables	Expected sign	Measurement	Studies	Sources
UN	Unemployment		% of total labor force	Sahnoun and Abdennadher (2019), Gaponenkoa and Glenn (2020), Raifu (2021).	*Unemployment by International Labour Organization, ILOSTAT database. Data as of June 2022.* The World Bank. https://data.worldbank.org/indicator/SL.UEM.TOTL.ZS
HC1	Primary completion rate	-	% of relevant age group	Connelly and Zheng (2003), Zhang and Zhuang (2011), Sehrawat and Giri (2017)	*Primary completion rate by UNESCO Institute for Statistics. Data as of June 2022.* The World Bank. https://data.worldbank.org/indicator/SE.PRM.CMPT.ZS
HC2	Secondary completion rate	+	% of relevant age group	Connelly and Zheng (2003), Zhang and Zhuang (2011), Sehrawat and Giri (2017), Raifu (2021).	*Secondary completion rate by UNESCO Institute for Statistics. Data as of June 2022.* The World Bank. https://data.worldbank.org/indicator/SE.SEC.CMPT.LO.ZS
HC3	Tertiary completion rate	-	% of relevant age group	Connelly and Zheng (2003), Zhang and Zhuang (2011), Sehrawat and Giri (2017)	*Tertiary completion rate by UNESCO Institute for Statistics. Data as of June 2022.* The World Bank. https://data.worldbank.org/indicator/SE.TER.ENRR
GE	Government Effectiveness	-	Rate from 0 to 100 (%)	Sahnoun and Abdennadher (2019).	*Government Effectiveness by Worldwide Governance Indicators. Data as of June 2022.* http://www.info.worldbank.org/governance/wgi/
PS	Political Stability	-	Rate from 0 to 100 (%)	Sahnoun and Abdennadher (2019).	*Political Stability by Worldwide Governance Indicators. Data as of June 2022.* http://www.info.worldbank.org/governance/wgi/
LnHT	High-tech export	-	US dollar in natural logarithm	Sozinova (2018).	*High-tech export by United Nations, Comtrade database through the WITS platform. Data as of June 2022.* The World Bank. https://data.worldbank.org/indicator/TX.VAL.TECH.CD
INF	Inflation	+	Consumer price (%)	Mankiw (2001), Mosikari (2013), Maqbool et al. (2013), Ogbeide et al. (2015).	*Inflation rate by International Monetary Fund Datasets. Data as of June 2022.* International Monetary Fund. https://www.imf.org/external/datamapper/PCPIPCH@WEO/OEMDC/ADVEC/WEOWORLD

Table 1: Copntinued

Sign	Variables	Expected sign	Measurement	Studies	Sources
POP	Population	+	Total population (billion)	Maqbool et al. (2013).	*Population by United Nations Population Division.* The World Bank. https://data.worldbank.org/indicator/SP.POP.TOTL
LnGDP	GDP	-	US dollar in natural logarithm	Maqbool et al. (2013), Ogbeide et al. (2015), Sahnoun and Abdennadher (2019).	*GDP by World Bank national accounts data, and OECD National Accounts data files.* The World Bank. https://data.worldbank.org/indicator/NY.GDP.MKTP.CD
TO	Trade openness	+	% GDP	Ogbeide et al. (2015), Kirema (2019).	*Trade by World Bank national accounts data, and OECD National Accounts data files.* The World Bank. https://data.worldbank.org/indicator/NE.TRD.GNFS.ZS
LnED	External debt	+	US dollar in natural logarithm	Cahyadin and Ratwianingsih (2020).	*External debt stocks by World Bank, International Debt Statistics.* The World Bank. https://data.worldbank.org/indicator/DT.DOD.DECT.CD
GEX	Government expenditure	+	% GDP	Ogbeide et al. (2015)	General government final consumption expenditure by *World Bank national accounts data, and OECD National Accounts data files.* The World Bank. https://data.worldbank.org/indicator/NE.CON.GOVT.ZS
FDI	Foreign direct investment	+	% GDP	Maqbool et al. (2013), Ogbeide et al. (2015).	*Foreign direct investment by International Monetary Fund.* The World Bank https://data.worldbank.org/indicator/BX.KLT.DINV.WD.GD.ZS
INV	Investment	-	% GDP	Mosikari (2013)	*Gross capital formation by World Bank national accounts data, and OECD National Accounts data files.* The World Bank. https://data.worldbank.org/indicator/NE.GDI.TOTL.ZS

Source: authors' work.

The study used balanced panel data for Asian countries for the period from 2007 to 2020. After excluding countries with insufficient data, 46 countries were selected with 644 observations (46 countries*14 years) for implementation of the research paper. The data are collected from the World Bank (WB), WGI, and IMF. Table 2 shows the descriptive statistics of the variables included in the model.

The results from Table 2 show that the model has all 15 variables and 644 observations, in which, the unemployment rate ranges from 0.11 to 20.71, and the mean is 5.814022.

Table 2: Descriptive statistics of all variables

No	Variables	Observation	Mean	Standard Deviation	Min	Max
1	Un	644	5.814022	4.309225	0.11	20.71
2	HC1	644	93.22429	13.01612	10.0345	121.7223
3	HC2	644	82.50651	19.79582	36	118.6497
4	HC3	644	37.31338	24.59744	2	116
5	GE	644	47.81366	26.59726	0.480769	100
6	PS	644	36.39953	26.85177	0	99.04762
7	LnHT	644	18.33588	5.332242	4.382027	27.92583
8	INF	644	163.1124	189.7729	0	1659.187
9	POP	644	0.092808	0.26824	0.000335	1.402112
10	LnGDP	644	24.01451	4.417807	6.232072	30.29428
11	TO	644	93.44743	55.01047	0.167418	437.3267
12	LnED	644	22.66206	2.589929	14.02362	28.48518
13	GEX	644	15.27506	11.06689	2.5	115.9326
14	FDI	644	6.259616	20.92065	-37.1548	280.1318
15	INV	644	26.08455	10.12239	0	69.497

Source: authors' work.

The value of high-tech exports ranges from 4.382027 to 27.92583 and has a mean value of 24.01451.Among the variables representing human capital, the tertiary education completion rate is the lowest and ranges from 2 to 116. The variables for institutional quality are governance effectiveness (GE) and political stability (PS), where GE ranges from 0.480769 to 100 and has a mean value of 26.59726, while the PS variable ranges from 0 to 99.04762 and has a mean of 36.39953. Foreign direct investment (FDI) ranges from -37.15476 to 280.1318. Data of the FDI variable are net capital inflows to GDP and negative values represent fewer new investment inflows.

The panel data regression model to analyze the impact of human capital, institutional quality and 4IR on the unemployment rate is as follows:

$$UN_{it} = \beta_0 + \beta_1 HC1_{it} + \beta_2 HC2it + \beta_3 HC3it + \beta_4 GEit + \beta_5 PSit + \beta_6 LnHTit + \beta_7 INFit + \beta_8 POPit + \beta_9 LnGDPit + \beta_{10} TOit + \beta_{11} FDI_{it} + \beta_{12} LnEDit + \beta_{13} GEXit + \beta_{14} INVit + e_{it} \quad (1)$$

in which i = 1, 2,.., N; t = 1, 2, …, T (N is total number of Asian countries, T is the time of observation), μi is the fixed effect for country i, independent and identically distributed error terms $e_{it} \approx$ i.i.d (0, σ_e^2), E(μi/eit) = 0.

Balanced panel data estimation techniques and Stata 16.0 software were used to process the data. Pooled-OLS, Fixed effect, and Random effect model are used. After that, FGLS and two-step system GMM methods continued to be applied to handle the heteroscedasticity and endogeneity in the research model. The GMM model is:

$$UN_{it} = \beta_0 + \beta_1 UN_{it-1} + \beta_2 HC1_{it} + \beta_3 HC2it + \beta_4 HC3it + \beta_5 GEit + \beta_6 PSit + \beta_7 LnHTit + \beta_8 INFit + \beta_9 POPit + \beta_{10} LnGDPit + \beta_{11} TOit + \beta_{12} FDI_{it} + \beta_{13} LnEDit + \beta_{14} GEXit + \beta_{15} INVit + e_{it} \quad (2)$$

RESULTS

The regression results of model (1) are shown in Table 3. Columns 1, 2, 3 and 4 of the table present the estimation results of Pooled OLS, FEM, REM, and FGLS, respectively. The results of the F test and Hausman test suggest that REM is the best suitable model for the data; however, the test results show that there is a phenomenon of variable variance and autocorrelation in the REM model. To fix this problem, the REM regression was continued using the xtgls command with a combination of both panels (heteroskedastic) and corr (ar1) options. The estimated results of model (2) in column 5 show that 12 variables are statistically significant including HC1, HC2, HC3, GE, PS, LnHT, INF, POP, LnGDP, LnED, GEX, and FDI. There are 2 variables that are not statistically significant, TO and INV. In addition, the coefficient between the current unemployment rate and the past unemployment rate is quite high (0.9550942) with a significance

level of 1%, indicating that an unemployment shock can have a lasting effect on the employment problem in Asian countries. The AR2 test value is greater than 5%, so the hypothesis H_0 is accepted (H_0: there is no autocorrelation); that is, the model has no autocorrelation and the Hansen test also has a p-value of 0.638.

Table 3: Estimated results

Variables	(1) POOLED	(2) FEM	(3) REM	(4) FGLS	(5) GMM
L.UN					0.9550942*** [22.99]
HC1	-0.05985*** [-3.73]	0.017282** [2.28]	0.014705* [1.91]	-0.005 [-0.91]	-0.0373** [-2.38]
HC2	0.064399*** [5.17]	-0.0037 [-0.45]	0.000873 [0.1]	0.010115* [1.87]	0.029736** [2.28]
HC3	0.043041*** [5.43]	-0.03362*** [-3.73]	-0.01759** [-2.12]	0.021713*** [3.6]	-0.01978** [-2.18]
GE	0.003123 [0.32]	-0.01973* [-1.95]	-0.0121 [-1.28]	-0.01259*** [-2.67]	0.027154** [2.16]
PS	-0.06096*** [-7]	-0.01994** [-2.45]	-0.02012*** [-2.59]	-0.01686*** [-4.01]	-0.03048*** [-2.89]
LnHT	-0.13999*** [-3.33]	-0.03992 [-1.34]	-0.03728 [-1.26]	-0.02787* [-1.75]	0.178671*** [2.58]
INF	0.001407 [1.57]	-0.0017*** [-2.61]	-0.0015** [-2.32]	0.000287 [0.36]	0.001639*** [3.26]
POP	-0.25601 [-0.36]	11.44288** [2.22]	-0.29401 [-0.16]	0.04992 [0.12]	-3.02682*** [-5.18]
LnGDP	-0.10778*** [-3.02]	-0.05813*** [-4.42]	-0.0569*** [-4.26]	-0.05342*** [-10.3]	-0.05911*** [-11.35]
TO	-0.00577 [-1.81]	0.006251* [1.71]	0.004758 [1.36]	-0.00271 [-1.34]	0.004011 [0.76]
LnED	-0.0163 [-0.21]	0.40182*** [3.7]	0.293181*** [2.96]	0.034531 [0.6]	0.435178*** [2.95]
GEX	-0.01943 [-1.15]	-0.00945 [-0.69]	-0.00837 [-0.63]	0.007991 [0.88]	0.107031*** [4.07]
FDI	0.029561*** [4.03]	0.010413*** [2.9]	0.011792*** [3.24]	-0.00076 [-0.18]	0.005643*** [6.69]
INV	-0.01649 [-0.96]	-0.03242*** [-3.3]	-0.03209*** [-3.24]	-0.00953 [-1.49]	0.002085 [0.1]
Constant	12.94322*** [5.18]	0.009289 [0]	2.463992 [1.04]	6.392485*** [4.29]	-12.0403*** [-2.8]
Observations	644	644	644	644	368
Numbers of instruments					41
F test	111.51***				
Hausman test	15.09				
Heteroskedasticity test	2772.15***				
Autocorrelation test	48.342***				
Arellano-Bond (AR2) test	0.090				
Hansen test	0.638				

Note: The asterisk *, ** and *** denotes statistical significance at 10, 5 and 1 percent levels, respectively

Source: authors' work.

DISCUSSION

Human capital: the results show that HC1 and HC3 reduce unemployment, while HC2 increases unemployment at a significant level of 5%. This reflects that primary education is a basic and compulsory foundation that people are exposed to through learning letters or simple calculations, thereby serving as a knowledge base to form human capital and avoid unemployment because of "illiteracy." However, workers graduating from secondary school with basic knowledge are still not skilled or aware enough to claim higher-level careers, easily quitting their jobs or working without a contract, leading to an increase in unemployment. The results are consistent with Raifu (2021).

The unemployment rate will decrease by 0.01978% when the tertiary education completion rate increases by 1%, indicating that people with high levels of education will have good job opportunities. Knowledge not only helps employees meet job requirements, but also helps them to easily access changes in 4IR. These findings are consistent with Sozinova (2018).

High-tech exports (HT): The estimated coefficient of HT is positive and significant at a 1% level, showing that high-tech exports increase unemployment. This result is in contrast to Sozinova (2018). On one hand, businesses increasingly need high-tech equipment to improve operational efficiency; on the other hand, high-tech devices also need almost absolute accuracy that humans cannot achieve, and are thereby replaced by robots that are programmed in a certain way to manufacture products. Such equipment will gradually replace conventional labor. Programming software or control devices need human resources, with high skill levels as well as high levels of knowledge to operate. Asian labor resources are abundant, but the number of highly trained workers is very small. High-tech manufacturing factories will also tend to look to countries with technological advantages for development, leading to unemployment in other countries. Craft industries will also gradually disappear under the exponential influence of 4IR.

Institutional quality: GE's estimated coefficient is positive and statistically significant at 5%, showing that governance performance in Asian countries between 2007 and 2020 increased the rate of unemployment. This result is in contrast to Sahnoun and Abdennadher (2019), which indicated that the level of government management in Asian countries is still loose and has not been thoroughly understood. They also found no linkage between levels of governance that could lead to a lack of information or misinformation. In contrast, the estimated coefficient of PS is negative at a significant level of 5%, consistent with Sahnoun and Abdennadher (2019). This proves that political stability in Asian countries will contribute to creating a stable working environment for employees, thereby reducing the unemployment rate.

Other factors, such as inflation, foreign direct investment, government spending, and external debt also have a positive impact on the unemployment rate. Specifically, when inflation increases by 1%, the unemployment rate will increase by 0.001639% at a significant level of 1%. This result is consistent with the findings of Mankiw (2001) and Ogbeide et al. (2015). Attracting a lot of FDI is an opportunity, but also a challenge, for Asian countries because there is a shortage in the skilled labor force. As such, the unemployment rate is still increasing. Government spending and external debt are also factors that increase the unemployment rate, showing that the efficiency of government spending, especially poverty alleviation, is still low. The pressure to repay loans will reduce aggregate demand and investment, which lead to a decrease in economic growth and an increase in the unemployment rate. This result is consistent with Cahyadin and Ratwianingsih (2020).

Population and GDP are two factors that can assist reduce unemployment. The results of this research show that when the population grows by one billion people, the unemployment rate drops by 3.02682%. This can explain that the aging population in Asia contributes significantly to the unemployment rate. It is estimated that Asia's older people will reach 923 million by 2050 (ADB, 2018). Asia's fertility rate is on a downward trend, from 2.61 in 2000 to 2.15 in 2020, while the average age tends to increase from 26 years old in 2000 to 32 years old in 2020, according to danso.org. The average age of Asians in 2050 is estimated to be 39.9 years old. The next factor that reduces unemployment is GDP. An increase in GDP will cause the money multiplier effect to increase, leading to a tendency for workers to spend more. This will motivate those

who are unemployed to look for work. An increase in GDP also indicates an improvement in labor productivity, implying that more jobs will be generated and unemployment will decrease. This finding is consistent with Sahnoun and Abdennadher (2019).

CONCLUSION AND RECOMMENDATION

The study aimed to determine how human capital, institutional quality, and 4IR affect the unemployment rate in Asian countries over the period from 2007 to 2020. Regression methods such as Pooled - OLS, FEM, REM, FGLS, and two-step system GMM were applied for this this article. The results show that human capital has an impact on the unemployment rate. Specifically, HC1 and HC3 have a positive impact, while HC2 has a negative impact on the unemployment rate. In terms of institutional quality, the results suggest that governance effectiveness has a positive effect, while political stability has a negative impact on the unemployment rate of Asian countries. The study also provides evidence that increases in inflation, government spending, external debt, and foreign direct investment will increase the number of unemployed workers. On the contrary, an increase in population and GDP has the effect of reducing the unemployment rate.

Findings have proven that 4IR increases unemployment in Asian countries. Therefore, to adapt to 4IR, countries need to develop human resources in accordance with the requirements of industrialization and modernization. The governments of Asian countries also need to develop plans and propose new policies for workers in occupations with high potential for replacement and join international organizations to learn and exchange experiences to solve the problem of unemployment in the 4.0 era.

The results have also suggested that to reduce unemployment, Asian governments need to improve institutional quality by improving governance effectiveness and maintaining political stability. Still, further studies in the area of exploring effectiveness in country-specific scenarios are needed.

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APPENDIX

Table A1: Countries covered by the study

1	Afghanistan	9	China	17	Jordan	25	Lebanon	33	Pakistan	41	Turkmenistan
2	The United Arab Emirates	10	Cyprus	18	Japan	26	Sri Lanka	34	Philippines	42	Timor-Leste
3	Armenia	11	Georgia	19	Kazakhstan	27	Maldives	35	Qatar	43	Turkey
4	Azerbaijan	12	Indonesia	20	Kyrgyzstan	28	Myanmar	36	Saudi Arabia	44	Uzbekistan
5	Bangladesh	13	India	21	Cambodia	29	Mongolia	37	Singapore	45	Vietnam
6	Bahrain	14	Iran	22	South Korea	30	Malaysia	38	Syria	46	Yemen
7	Brunei	15	Iraq	23	Kuwait	31	Nepal	39	Thailand		
8	Bhutan	16	Israel	24	Laos	32	Oman	40	Tajikistan		

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