

Investigating the Association Between Economic Conditions and Sports Performance in Asia: A Panel Data Approach

Mochammad Fahlevi¹, Kittisak Jermsittiparsert^{2,3,4,5,6*}, Watcharin Joemsittiprasert⁷, Oytun Sözüdoğru⁸, Talip Emiroğlu⁹, Mohammed Aljuaid¹⁰

Abstract

Knowing the factors that influence a nation's sporting performance can aid in formulating appropriate policies and plans. This study examines the relationship between gross domestic product, population, total debt, inflation, and trade as a proportion of GDP for eleven Asian nations from 1998 to 2018. Panel unit root tests, cointegration tests, and finally, Fully Modified Ordinary Least Square (FMLOS) were used to examine the relationships between the variables. The panel results revealed that GDP and TRD favorably and significantly impact national sports performance, whereas POP and TD have a negative impact. INF was discovered to have a negligible effect on national athletic performance. Hence, we suggest that Asian nations take appropriate measures to boost national sporting achievements.

Keywords: national sports performance, gross domestic product, economic indicators, panel cointegration model, fully modified ordinary least square

Introduction

The success of national teams in international sports competitions is substantially influenced by macroeconomic issues (Shibli, De Bosscher, & Van Bottenburg, 2013). The number of medals won by a country or its achievement at the national or international level is indicative of its socio-economic strength. Due to their economic strength, the nations achieved a prominent position on international sports platforms despite their sizes and strengths (Forrest et al., 2017). So, the discussion brings us to the influence of economic conditions and advancements that can make a difference in obtaining peak athletic performance. For the past two decades, the Asian region's participation in mega-sporting events, such as the Asian Games and the Asian Olympics, has increased significantly.

Notwithstanding advancements in sports, the economic situation of certain places has posed significant impediments to obtaining the desired level of sporting success. Due to their weak socio-economic growth, many African and Asian nations fail to succeed internationally (Amara, 2020). Previous research also revealed that a

country with a higher GDP and affluence would have a greater variety and number of medal winners. As a result, countries that enhance their economic standing earn the top spot in international sports competitions. Strong economies ensure the availability of sports facilities, which directly impacts national pride in sports (Eime et al., 2017). Table 1 illustrates that the top-ranked Asian countries with the most medals are those with the highest GDP growth and those located in the region's developed economies.

In contrast, governmental debt and crises result in inadequate sports funding, which is strongly correlated with the lowest levels of athletic performance. Due to the economic downturn, the sport's budget was reduced, discouraging international athletes from achieving higher ranks for their respective nations (Giannoulakis et al., 2017). Thus, the sport's industry and national sports pride face different economic obstacles, subsequently impacting medal achievement at the Olympic or Asian games (Shasha, Abbasi, & Sohail, 2022). According to the existing literature, there is a high correlation between a country's economic conditions and its sporting performance. The economic development of a nation has a direct impact on its sporting development. Due to a lack of physical training, sports clubs,

¹ Management Department, BINUS Online Learning, Bina Nusantara University, INDONESIA. E-mail: mochammad.fahlevi@binus.ac.id

² Faculty of Education, University of City Island, CYPRUS

³ Publication Research Institute and Community Service, Universitas Muhammadiyah Sidenreng Rappang, INDONESIA

⁴ Faculty of Social and Political Sciences, Universitas Muhammadiyah Makassar, INDONESIA

⁵ Faculty of Social and Political Sciences, Universitas Muhammadiyah Sinjai, INDONESIA

⁶ Sekolah Tinggi Ilmu Administrasi Abdul Haris, INDONESIA

⁷ New York Institution for Continuing Education, USA.

⁸ Faculty of Education, University of City Island, CYPRUS

⁹ Faculty of Education, University of City Island, CYPRUS

¹⁰ Department of Health Administration, College of Business Administration, King Saud University, Riyadh, Saudi Arabia

*Corresponding author E-mail: kittisak.jermstiparsert@adakent.edu.tr

equipment, and financial resources to support their athletes, underdeveloped nations with shaky economies typically have less opportunities to excel in sports competitions. The weakest foundation for the underdevelopment of sports is

economic underdevelopment. In addition to corruption, lack of merit, and inefficient governance, corruption, lack of merit, and ineffective governance keep sport development relatively poor in low-developed economies (Andreff, 2001).

Table 1

2018 Asian games champions and GDP

Rank	NOC	Gold	Silver	Bronze	Total	GDP
1	China (CHN)	102	67	50	219	18.3 trillion dollars
2	Japan (JPN)	52	47	63	162	4.94 trillion dollars
3	South Korea (KOR)	37	42	50	129	1.73 trillion dollars
4	Indonesia	30	22	36	88	1.38 trillion dollars
5	Iran	19	16	17	52	1.97 trillion dollars

There is a paucity of literature that analyzes the role of economic performance on the efficacy of sports in the Asian region, even though numerous studies have demonstrated that a country's success is significantly influenced by its economic resources that are available for sports (Andreff, 2006; Manuel Luiz & Fadal, 2011). This study explores this essential aspect of sports studies due to the lack of research on the effect of Asia's successful economic integration into the global economy on the region's sporting performance. This paper's primary objective is to investigate the effect of economic conditions on sports performance in Asia; hence, its purpose is stated as follows:

RO1: To study the linkage between economic performance and sports performance in the Asian region.

RO2: To investigate whether economic growth and stability influence national sports performance.

RO3: To study how factors like debt, trade, and economic growth mobilize sports performance within Asia.

This study examined sports performance from an economic standpoint, a novel method in Asian sports literature. Hence, this research effectively addresses the lack of prior sports economics studies, particularly in Asia. This study's findings identify the economic impact as a booster of sports performance, attracting the attention of policymakers to increase expenditures and measures to stimulate the economy to achieve optimal sports performance. Moreover, as Asian nations have successfully integrated into the global economy, the conclusions of this study advocate the efficient use of the economy to improve sports performance.

Literature Review

This study's literature section aims to examine the available studies that illustrate the relationship between economic conditions and athletic performance. It is believed that the

economic disparities between developed and developing nations worldwide have affected sports performances and participation in sporting events (Ahmad et al., 2019; Leeds & Von Allmen, 2016). There has been less focus on the economic causes and indicators that lead to developing nations' sports underdevelopment and development in developed economies (Andreff & Scelles, 2021; Chacón-Araya, Villarreal-Ángeles, & Moncada-Jiménez, 2018; Manuel Luiz & Fadal, 2011; Seguí-Urbaneja et al., 2022). In the 21st century, the Asia-Pacific region has also been observed attempting to perform well and ensure participation in international sports competitions. It is a bright spot but requires efforts and stern measures to correct economic and socio-economic conditions to improve sports performances (Lee & Tan, 2019).

Recent research finds various economic factors that influence sports performance. The research highlighted the GDP growth rate, GDP per capita, human development index ratings, and debt as some of the most influential economic factors on a nation's sports. The research was evaluated by focusing on Asian sports performance in international competitions (Andreff & Scelles, 2021). So, the strength of a country's economy can explain its sporting prowess.

According to the existing literature, there is a high correlation between a country's economic conditions and its sporting performance (Giampiccoli, Lee, & Nauright, 2015; Terreros, Manonelles, & López-Plaza, 2022; Valenzuela, Piña, & Ramírez, 2017). The economic development of a nation has a direct impact on its sporting development. Due to a lack of physical training, sports clubs, equipment, and financial resources to support their athletes, underdeveloped nations with shaky economies typically have less opportunities to excel in sports competitions. The weakest foundation for the underdevelopment of sports is economic underdevelopment. In addition to corruption, lack of merit, and inefficient governance, corruption, lack of

merit, and ineffective governance keep sport development relatively poor in low-developed economies (Andreff, 2001). In poor economies, sports must face several obstacles. According to some studies, sports are neither a priority nor receive the same money as training in underdeveloped nations. The problem begins with a lack of physical education in schools, the absence of gaming classes, and the discouragement of sports and outdoor extracurricular activities among children. UNESCO studies focusing on Africa and Asia indicated that schools provide no sports facilities, equipment, or training, instead discouraging children from participating in physical education (Souchaud, 1995). So, compared to less developed nations, economically powerful nations are more likely to win gold in sporting events due to their larger sports budget allocations, better training, qualified coaches, and greater facilities (Andreff, 2006).

Prior study has examined the relationship between Gross Domestic Product (GDP) and athletic performance. Greater a country's GDP, the more likely it is to sponsor athletic activities and athlete development. Examples from the United Kingdom and the United States demonstrate how considerably these nations have boosted their sports budgets to improve their performance in international competitions (Andrade Rosas & Flegl, 2019). According to an Olympics analysis, the likelihood that a nation would perform best and win the most medals is greater for nations with robust economies and a higher GDP per capita (Andreff, 2004).

Studies undertaken in the setting of undeveloped Asian and African nations indicate that their poor athletic performance results from their weak economies and lack of socio-economic development. GDP, GDP per capita, and a few other metrics have been demonstrated to significantly affect the sports performance of nations (Manuel Luiz & Fadal, 2011).

To grow, the sport requires government investment and assistance, yet, the poor economies of the globe receive limited support and investment, which badly impacts their sports performance. According to a study, a country's sports are influenced by its socio-economic characteristics. Based on testing socio-economic indicators such as the poverty index (HPI), human development index (HDI), and material well-being index (MWI) on various economies, it was determined that HDI is a significant factor in determining a country's sports development level. HDI was correlated with athletic performance (Chacón-Araya et al., 2018). HDI is an important development indicator that, unlike GDP, focuses on multiple development elements rather than just economic growth. The majority of countries with stable and sustainable

economic growth are also socially developing and have higher HDI rankings, according to Majerová (2012). Hence, even this research demonstrates that economically developed nations have developed sports and improved athletic performance.

In addition, socio-economic variables, such as corruption, unequal wealth distribution, and drug scandals, impact sporting events and athletic results. In less developed economies, the HDI was lower, while the corruption index (CI) and Anti-Doping rule infractions were higher, negatively impacting the sporting performance of these nations. The investigations were conducted within the setting of low-income nations in Asia and Africa (Terrerros et al., 2022).

According to the existing literature, sports play a vital role in globalization and the international prestige of nations. Shortly, there will be greater opportunities for sports in Asia due to the improving growth prospects of Asian markets in the changing global order. Nations such as China, India, Japan, and Korea, as well as the Central Asian Republics, will maximize their sporting prowess. The Asian commodities, markets, and shifting predominance are paving the way for Asia Pacific to expand its sports industry, which has been relatively underdeveloped compared to the world's wealthier and more industrialized nations. International sports depend on economic conditions, according to the current literature. In recent years, sports have replaced ecological concepts with economic ones (Horton, 2012).

Methodology

Data collection is the first and most critical step in the analysis process and is crucial for verifying the validity and precision of the findings. This study examines the impact of economic growth and wealth on the athletic performance of Asia. For this reason, the researcher gathered information from the ten Asian nations that have finished in the top ten at the Asian Games since 1951. Since the Asian Games are held every four years, the researcher only collected data for the years in which the games were held, and the results were announced. Consequently, statistics from games held after 1961 were collected, as data for economic indicators became available after 1961. The data was acquired mostly from the World Bank's web database, and information on a country's success in the Asian games was approximated by the number of medals it won in the record year. The study contained five explanatory variables, three representing the country's economic situation and the remaining two serving as

control variables. As indicators of economic prosperity, GDP growth, trade as a proportion of GDP, and total debt as a percentage of GDP were utilized, while population and inflation served as control variables. The expression is as follows:

$$NSP_{it} = \alpha + \beta_1 GDP_{it} + \beta_2 TRD_{it} + \beta_3 TD_{it} + \beta_4 INF_{it} + \beta_5 POP_{it} + \varepsilon_{it}$$

NSP indicates national sports performance, GDP represents GDP growth, TRD represents trade%, TD represents total debt%, POP represents population growth, INF represents inflation, and ε_{it} signifies an error word. The PP unit root test, cross-sectional dependence, Pedroni cointegration test, and

FMOLS coefficient estimate approach were utilized to estimate the associations between the variables.

Results

Using skewness, kurtosis, and Jarque-Bera, a descriptive analysis of the data was conducted to find the mean and normalcy. NSP and INF do not adhere to a normal distribution according to the suggested thresholds of -2 and +2 for skewness (Hair et al., 2010). The Jarque-Bera significance level indicates the lack of a normal distribution for GDP, INF, TD, NSP, and TRD.

Table 2

Descriptive Statistics

	GDP	INF	NSP	POP	TD	TRD
Mean	4.801526	8.237526	82.18667	1.717427	2.363642	36.67397
Median	5.003232	4.670892	33.00000	1.633763	0.969555	33.95935
Maximum	23.17125	178.8667	2016.000	4.878937	20.33275	134.0869
Minimum	-13.12673	-98.70383	0.000000	-0.132694	0.000000	0.000000
Std. Dev.	4.952520	19.67717	182.8492	0.953852	3.358374	28.90489
Skewness	-0.344670	3.791593	8.103545	0.273542	2.089032	1.043725
Kurtosis	5.724198	45.49428	84.76559	2.757371	8.829442	4.358334
Jarque-Bera	49.35278	11645.43	43426.76	2.238555	321.4914	38.76574
Probability	0.000000	0.000000	0.000000	0.326516	0.000000	0.000000
Sum	720.2289	1235.629	12328.00	257.6140	354.5463	5501.096
Sum Sq. Dev.	3654.591	57691.45	4981643.	135.5652	1680.522	124488.4
Observations	150	150	150	150	150	150

GDP= Gross domestic product, INF= Inflation, NSP= National sports performance, Pop= Population, TD= Total debt, TRD= Trade % of GDP

Cross-dependency can lead to erroneous and inconsistent estimates in the model. Hence a preliminary test for cross-sectional reliance was conducted before panel data analysis (Xu, Cai, & Fang, 2016). The results of cross-sectional dependence tests using three statistical methods to detect the presence of cross-dependence are presented in Table 3, which indicates that error terms are not cross-correlated (Pesaran, 2021). Table 2's results demonstrate that the p-value is less than 0.05, rejecting the null hypothesis of cross-sectional independence and demonstrating that the residuals are cross-sectionally dependent.

Table 3

Cross-Section Dependence Test

Test	Statistic	d.f.	Prob.
Breusch-Pagan LM	136.2720	45	0.0000
Pesaran scaled LM	8.566818		0.0000
Pesaran CD	2.862169		0.0042

We used a unit root test to assess the order of integration and stationarity of the variables, beginning with the null hypothesis that the data is non-stationary and the panel series has root units. Thus, a panel unit root test is deemed the most appropriate method for analyzing the data in the present investigation. The unit root test enables us to determine the integrating relationship. Table 4 displays the test results to determine if the variables are stationary at the level or first difference. According to the results, only the GDP and INF are currently stable. Hence, applying the first difference resulted in the acceptance of the null hypothesis for NSP, POP, and TD and showed the presence of a unit root. Thus, five of the six variables were stationary at the initial difference. The presence of stationary data may indicate a long-run relationship; hence, a cointegration test was used to examine a long-run relationship between the selected variables, as shown in Table 4.

Table 4

Unit Root Test

Variable	Level	First difference
GDP	50.50**	72.16**
INF	45.65**	55.99**
NSP	29.10	50.85**
POP	34.76	47.88**
TD	7.12	21.46*
TRD	12.77	23.93

GDP= Gross domestic product, INF= Inflation, NSP= National sports performance, Pop= Population, TD= Total debt, TRD= Trade % of GDP

The Pedroni Panel Cointegration Test was used to examine whether there is a long-run relationship between the variables (Pedroni, 2019), and the test results are shown in Table 5. Test statistics for two fundamental methodologies are displayed. The table indicates that two of the four test statistics rejected the null hypothesis of no cointegration with p-values less than 0.05 for the within-dimension results. In addition, two of the three statistics in the between-dimension approach confirm the long-run correlation between variables with p 0.05, thereby rejecting the null hypothesis that there is no cointegration.

Table 5

Panel Cointegration Test

Alternative hypothesis: common AR coefs. (Within-dimension)				
	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	-0.335267	0.6313	-1.427128	0.9232
Panel rho-Statistic	0.809871	0.7910	1.475171	0.9299
Panel PP-Statistic	-6.828238	0.0000	-6.908035	0.0000
Panel ADF-Statistic	-6.698017	0.0000	-5.609573	0.0000
Alternative hypothesis: individual AR coefs. (Between-dimension)				
	Statistic	Prob.		
Group rho-Statistic	2.534961	0.9944		
Group PP-Statistic	-8.928787	0.0000		
Group ADF-Statistic	-6.890297	0.0000		

After establishing the long-run correlation, we approximated the long-run coefficients using Fully Modified Ordinary Least Squares to quantify the intensity and direction of the relationships (FMOLS). This method provides for managing measurement errors and correcting discrepancies caused by serial correlation (Shahbaz et al., 2020). P =0.05 indicates that GDP, TD, TRD, and POP substantially impact national sports in Asian nations. GDP ($\beta= 1.91$) and TRD ($\beta= 0.59$) have a beneficial effect on national sports

performance, but an increase in TD ($\beta= -3.47$) and POP ($\beta= -35.20$) have a negative effect. It was discovered that INF harms national sports performance ($\beta= -0.0027$). However, the association was not significant (p-value > 0.05). In addition, the R-square value indicates that the independent variables explain 70.3% of the variance in national sports performance, which is a desired outcome. We conclude that economic factors, such as GDP, TD, TRD, and POP, are major predictors of national sporting success.

Table 6

Panel Fully Modified Least Squares (FMOLS)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP	1.912855	0.162878	11.74413	0.0000
TD	-3.471087	0.109720	-31.63582	0.0000
TRD	0.596870	0.076765	7.775343	0.0000
POP	-35.21912	0.037458	-940.2328	0.0000
INF	-0.002791	0.071879	-0.038830	0.9691
R-squared	0.703623	Mean dependent var		51.55102
Adjusted R-squared	0.653632	SD dependent var		88.99196
SE of regression	52.37451	Sum squared resid		227676.4
Long-run variance	1555.104			

GDP= Gross domestic product, INF= Inflation, Pop= Population, TD= Total debt, TRD= Trade % of GDP

Discussion

The study's conclusions indicate a correlation between a country's economic status and sporting performance. Examining the relationship between economic conditions and athletic performance in Asia reveals a substantial effect. The findings indicate a correlation between economic situations and athletic performance in Asia. The economic state of a nation has a direct impact on the growth of sports in that nation. Increased funding for the country's sports department due to favorable economic conditions ensures sporting achievement. The data indicate that countries with stronger economic conditions promote superior athletic performance. It has been discovered that countries with stronger economies can invest more in sports through infrastructure development, training facilities, and other resources that enhance athletes' performance (Lee & Tan, 2019). The results reveal that the value of GDP growth is greater than 0.5, indicating that the GDP considerably affects the country's sporting success. GDP is believed to indicate a nation's economic health and stability. The relationship between sports performance and countries' economic growth is in terms of budget allocation. Steady GDP growth leads to budget allocation stability. The proportion of a country's gross domestic product devoted to sports must be prioritized. Countries with a rising trend in GDP growth have effectively managed their various institutions (Andreff & Scelles, 2021). Hence, it has been determined that the GDP expansion significantly benefits the country's sporting performance.

Moreover, the findings indicate that trade debt has a considerable but unfavorable effect on the country's sporting performance. It is determined that the value of the trade debt exceeds 0.5, yet the value is negative. It demonstrates that although trade debt greatly impacts sports performance, that impact is negative, indicating that trade debt hurts the country's sports success. There will be a detrimental influence on the performance of countries with high debt levels (Terreros et al., 2022). The status of trade debt causes a country to lose the ability to pay the sports department, resulting in a lack of resources, training, and other athlete-related activities. As a result of the country's inability to meet its financial obligations, the other connected authorities would also be affected. The machinery of state agencies would be negatively influenced, which would retard the growth performance of sports in the nation. The trade will result in a shortage of resources and a delay in their distribution to athletes and other important sports department stakeholders. The budget of the department of sports will be in jeopardy.

According to the principle of priority, under which other departments will be emphasized, and sports will be ignored, the authorities will become uneducated, inhibiting sports development and performance.

Similarly, the value of trade is determined to be 0.5, indicating that commerce has a large impact on sports performance. Nonetheless, trade is an economic indicator used to assess and evaluate a country's economic condition. Trade ensures the nation's economic stability. Trade ensures the expansion of a nation's GDP. It also implies a higher level of trade development, resulting in a more favorable economic climate. This indicates that increased economic development will lead to enhanced athletic performance. It is crucial to note that commerce, as an economic indicator, not only contributes to the growth of sports but also improves cultural values, the political system, and investment in various areas, including sports infrastructure (Chacón-Araya et al., 2018).

Furthermore, it demonstrates that commerce is seen as a significant aspect in enhancing the sports performance of a nation. The population has also been investigated, with results indicating a value greater than 0.5. This indicates that the population significantly but negatively affects the country's athletic performance. Population growth will result in a lack of resources, resulting in less emphasis on the country's sporting prowess (Manuel Luiz & Fadal, 2011). According to the findings, inflation has a detrimental effect on athletic performance, but the effect is not all that significant. It has a value of less than 0.5, indicating that it has no substantial effect on the country's athletic performance (Majerová, 2012).

Conclusion

The R squared value was found to be 0.70, indicating that the analyzed factors contribute 70 percent to enhancing the country's athletic performance. Consequently, it can be determined that the positive factors, such as GDP and trade, represent the country's economic prosperity, indicating that sports performance will improve as the economic conditions improve. While population and inflation have also been demonstrated to affect sports performance, the impact of inflation was determined to be of little relevance. In conclusion, investigating the relationship between economic situations and athletic performance is crucial to the subject of study. The findings provide insight into the economic factors affecting improving sports performance in Asia. The topic will benefit researchers and policymakers in making educated decisions regarding the investment and allocation of resources in sports performance in Asia. There are, however, significant drawbacks to the study, including

the fact that only a limited sample size was utilized to evaluate the relationship between economic success and sports performance and that only data from Asian games and countries were obtained. Future research should combine data from various championships and sporting events, such as the Olympics, European games, Mediterranean games, etc., to determine whether convergence in results exists. In addition, the researchers propose including socio-demographic,

social development, and institutional quality measures to examine their association with sports performance.

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