INDIA AND CHINA: THE ASIAN CENTURY

A comparative study on the rise of India and China as Economic Powerhouses

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Introduction

The past 3 decades has seen India and China rise as economic powerhouses in Asia as well as on the global stage. In 2019, they were the 5th and 2nd largest economies in the world respectively.

In this case study, we use descriptive statistical analysis to understand in detail the economic performance of these two rivals in the past decade, the different impacts of the Covid-19 Pandemic on the countries, and how China is winning in both.

ECONOMY OF INDIA

The economy of India is characterized as a developing market economy. It is the world's sixth-largest economy by nominal GDP and the third-largest by purchasing power parity (PPP). According to the IMF, on a per capita income basis, India ranked 142nd by GDP (nominal) and 124th by GDP (PPP) in 2020. From independence in 1947 until 1991, successive governments promoted protectionist economic policies with extensive state intervention and regulation. The end of the Cold War and an acute balance of payments crisis in 1991 led to the adoption of a broad program of economic liberalization. Since the start of the 21st century, annual average GDP growth has been 6% to 7%, and from 2014 to 2018, India was the world's fastest growing major economy, surpassing China.

ECONOMY OF CHINA

The economy of China, described as Socialism with Chinese characteristics since the 12th National Congress of the CCP in 1982, is a mixed socialist market economy which is composed of state-owned enterprises and domestic and foreign private businesses and uses economic planning.

The government began its economic reforms in 1978 under the leadership of Deng Xiaoping. China has four of the top ten most competitive financial centers (Shanghai, Hong Kong, Beijing, and Shenzhen) in the 2020 Global Financial Centres Index, more than any other country. According to the IMF, on a per capita income basis, China ranked 73rd by GDP (PPP) per capita in 2019.

Vital Statistics in 2019

	India	*China*
Population	1.381 Billion	1.434 Billion
GDP Nominal	US$ 2.868 Trillion	US$ 14.401 Trillion
GDP PPP	US$ 9.542 Trillion	US$ 23.393 Trillion
GDP Nominal per capita	US$ 2,097	US$ 10,286
GDP PPP per capita	US$ 6,977	US$ 16,708
HDI	0.647	0.758
Real GDP Growth Rate	4.2%	6.1%
Military Expenditure	US$ 71.1 Billion (2.4% of GDP)	US$ 261.1 Billion (1.9% of GDP)
Inflation	6.6%	2.9%
Unemployment Rate	5.4%	3.8%
Exports	US$ 330 Billion	US$ 2.5 Trillion
Imports	US$ 514 Billion	US$ 2.08 Trillion
Ease-of-Doing Business Rank	63rd (Easy)	31st (Very Easy)

Population

India and China have been the two most populous regions in the world for most of recorded history. This allowed to be by far the two largest economies in the world for almost two millennia from the 1st until the 19th century.

India and China account for about 35.5% of the world's population, with their current populations standing at about 1.38 billion and 1.43 billion respectively. Currently, India's population is growing at a much faster rate than China's, which would allow India to grow to be the most populous country by 2027 latest. Such large populations have allowed both countries compete with western economies, especially in the case of India, which has now equalled the GDP of UK (which only has about 1/20th the population of India).

From a simple linear forecast on the data of the last 10 years of both countries show that India's population taking over that of China's by 2023.

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
China	1,34	1,34	1,35	1,36	1,36	1,37	1,38	1,39	1,39	1,40	1,40
India	1,23	1,25	1,26	1,28	1,29	1,31	1,32	1,33	1,35	1,36	1,38

GDP Growth Rate

The growth rate of a country's GDP is the most convenient method of measuring a country's economic growth.

For the past 3 decades, China has recorded growth rates averaging at 10%, while India sustained an average growth rate of about 6.6%.

In the past decade, China continued to grow at higher rates than India, until in 2014, when India briefly overtook China to become the fastest growing major economy in the world until 2017.

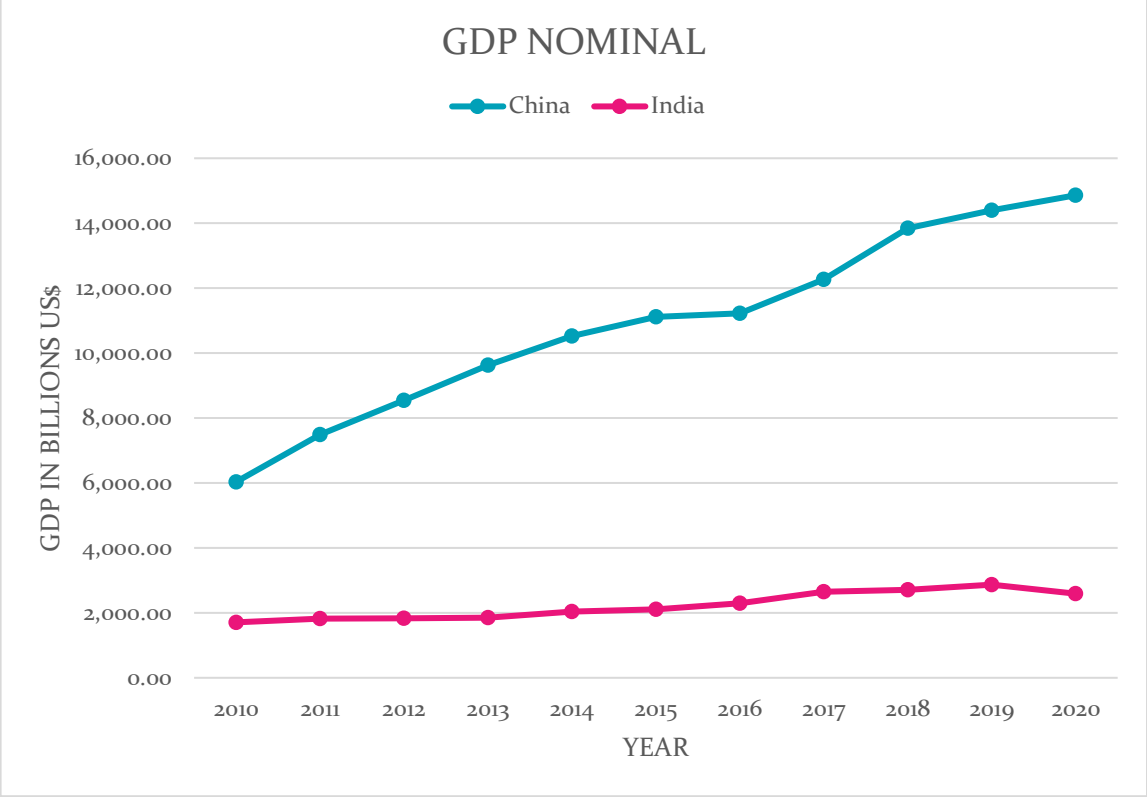
The Covid-19 Pandemic has had a drastic negative impact on the Indian Economy, which is estimated to contract by nearly 10.3%, in stark contrast to China, which is the only major economy in the world to register positive growth, at about 1.8%.

GDP Nominal

Gross domestic product (**GDP**) is a monetary measure of the market value of all the final goods and services produced in a specific time period. It is also defined as "an aggregate measure of production equal to the sum of the gross values added of all resident and institutional units engaged in production and services (plus any taxes, and minus any subsidies, on products not included in the value of their outputs)".

Just before the 1991 Indian Economic Crisis and subsequent Economic Liberalisation, India's GDP stood at US$ 326 Billion while that of China's was US$ 396 Billion. Since then, China's GDP has grown 35-fold to over US$ 14.3 Trillion, while the same for India has a 9-fold growth to US$ 2.9 Trillion. This is largely believed to be due to powerful economic reforms undertaken by China in 1978, which has since then recorded extraordinary growth rates that India has been unable to match ever since.

From being only 1.2 times the size of the Indian economy in 1991, today China's economy stands at 5.7 times



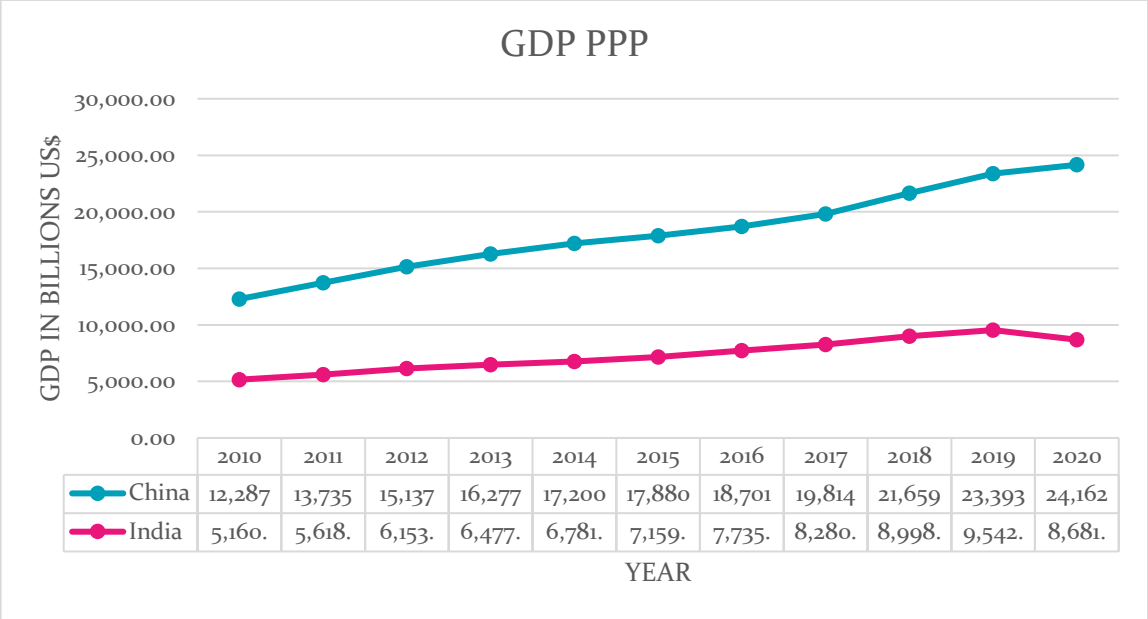
GDP Purchasing Power Parity

Purchasing power parity (**PPP**) is a measurement of prices in different countries that uses the prices of specific goods to compare the absolute purchasing power of the countries' currencies.

GDP comparisons using PPP are arguably more useful than those using nominal GDP when assessing a nation's domestic market because PPP takes into account the relative cost of local goods, services and inflation rates of the country, rather than using international market exchange rates, which may distort the real differences in per capita income. It is however limited when measuring financial flows between countries and when comparing the quality of same goods among countries. PPP is often used to gauge global poverty thresholds and is used by the United Nations in constructing the human development index.

Until 1984, India's GDP PPP was larger than China's. However, since China overtook India in GDP PPP in 1985, China has grown nearly 40-fold to have the largest GDP PPP in the world in 2019, valued at about US$ 23.4 Trillion, while India has grown about 15-fold to have the 3rd largest GDP PPP in the world, after China and the US, valued at about US$ 9.5 Trillion.

The 2020 Covid-19 Recession only further widened the gap. While India's GDP PPP contracted to an estimated US$ 8.6 Trillion, China's GDP PPP grew to an estimated US$ 24.1 Trillion.

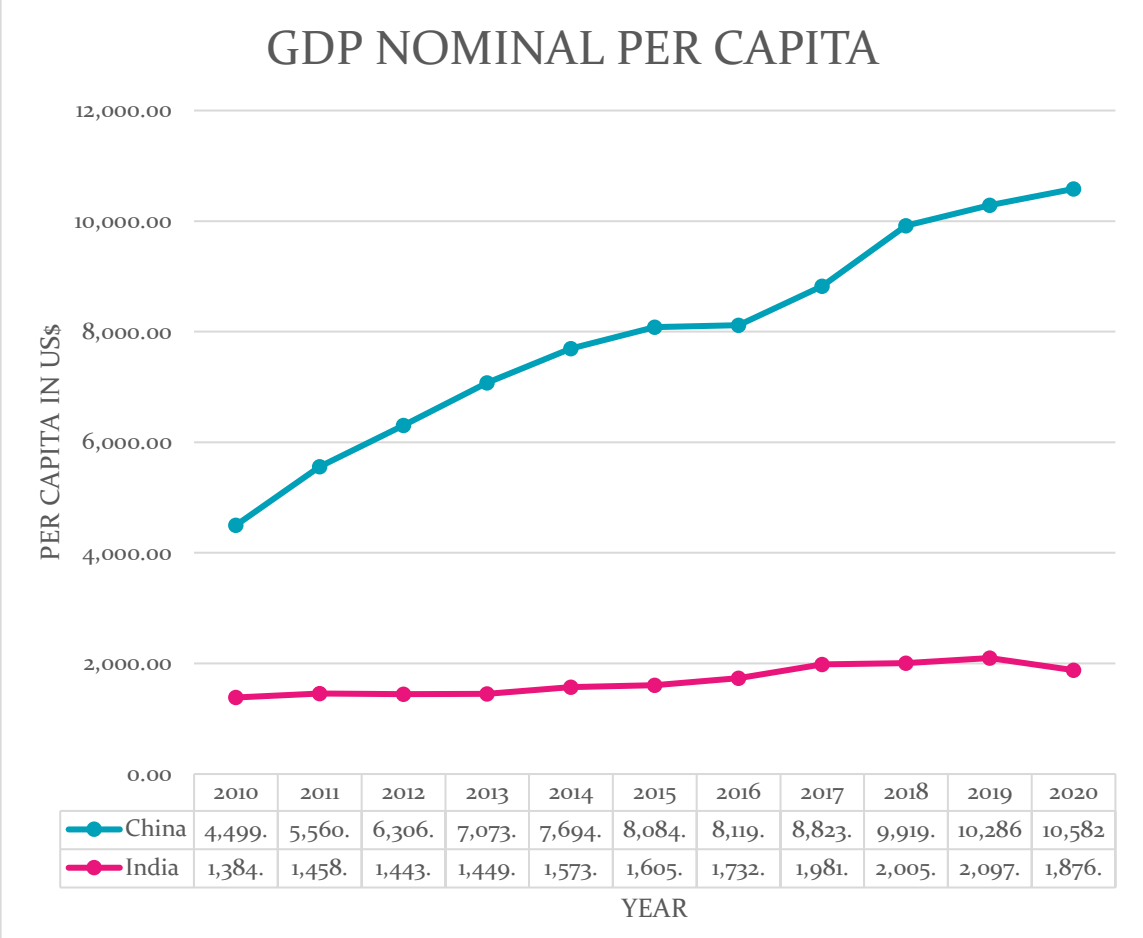


	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
China	12,287	13,735	15,137	16,277	17,200	17,880	18,701	19,814	21,659	23,393	24,162
India	5,160.	5,618.	6,153.	6,477.	6,781.	7,159.	7,735.	8,280.	8,998.	9,542.	8,681.

GDP Per Capita

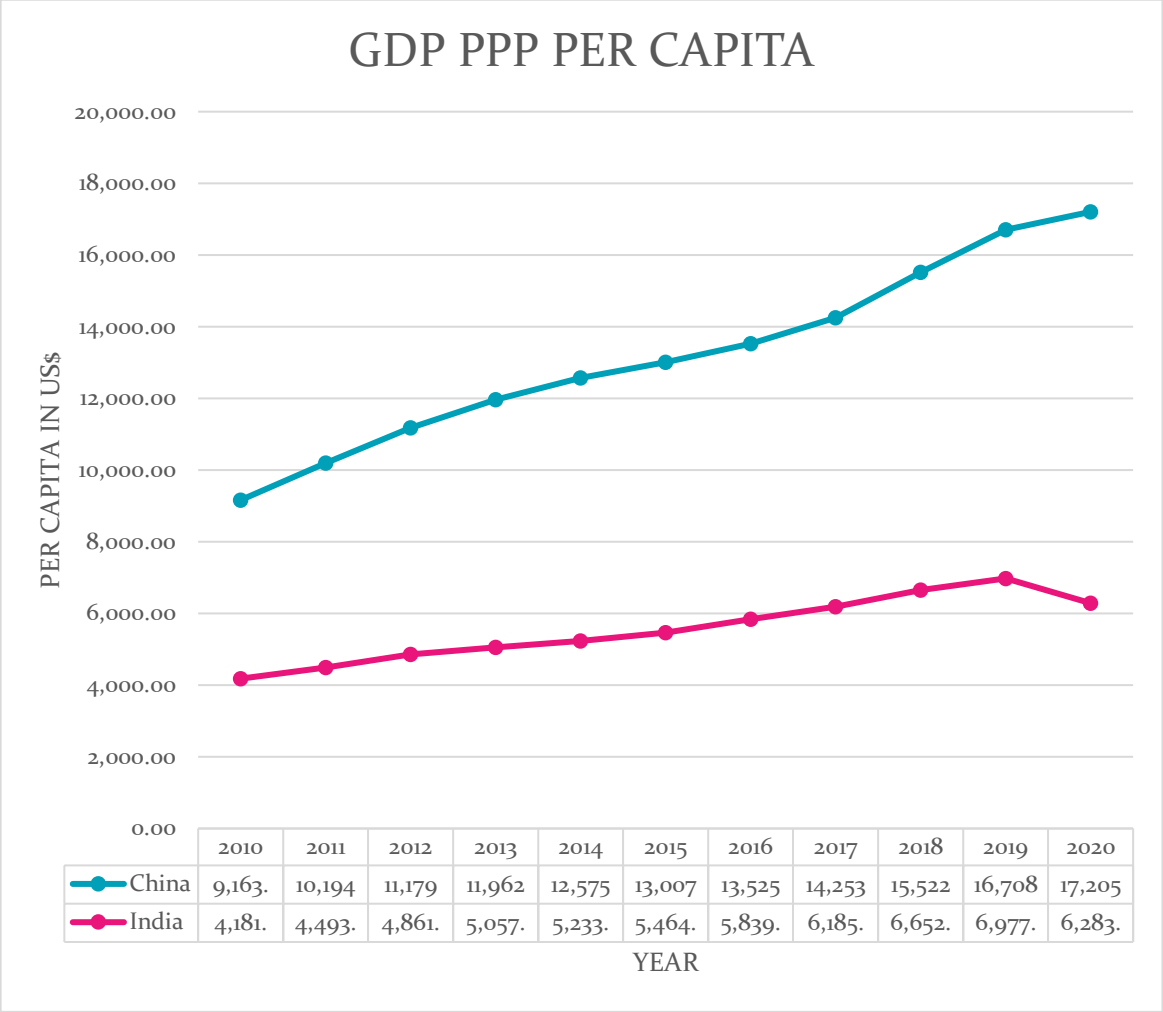
GDP per capita is an important measurement to understand the standard of living in a country. India and China have similar demographics, in that they have been the two most populous regions for the past two millennia.

For the past few decades, India's population has grown at much faster rate than China's; this coupled with China's higher economic growth has led to massive gap between the two countries' GDP per capita.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
China	4,499.	5,560.	6,306.	7,073.	7,694.	8,084.	8,119.	8,823.	9,919.	10,286	10,582
India	1,384.	1,458.	1,443.	1,449.	1,573.	1,605.	1,732.	1,981.	2,005.	2,097.	1,876.

For standard of living, GDP PPP per capita is a more useful metric than GDP Nominal per capita; this is because GDP PPP is adjusted to the relative cost of local goods & services, and inflation rates of the country.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
China	9,163.	10,194	11,179	11,962	12,575	13,007	13,525	14,253	15,522	16,708	17,205
India	4,181.	4,493.	4,861.	5,057.	5,233.	5,464.	5,839.	6,185.	6,652.	6,977.	6,283.

Other Factors

The following data is the average over a period of 11 years, 2010-20.

Average Total Investment, Average Gross National Savings and Average Current Account Balance are Arithmetic Mean.

For Average Percentage Change in Inflation, formula used is

$\prod_{2010}^{2020}(PCII + 100) - 100$ where PCII is percentage change in Inflation of each year.

Average Total Investment

China	44.705
India	33.17981818

Average Gross National Savings

China	46.57836364
India	31.27127273

Average Current Account Balance

China	1.878
India	-1.917636364

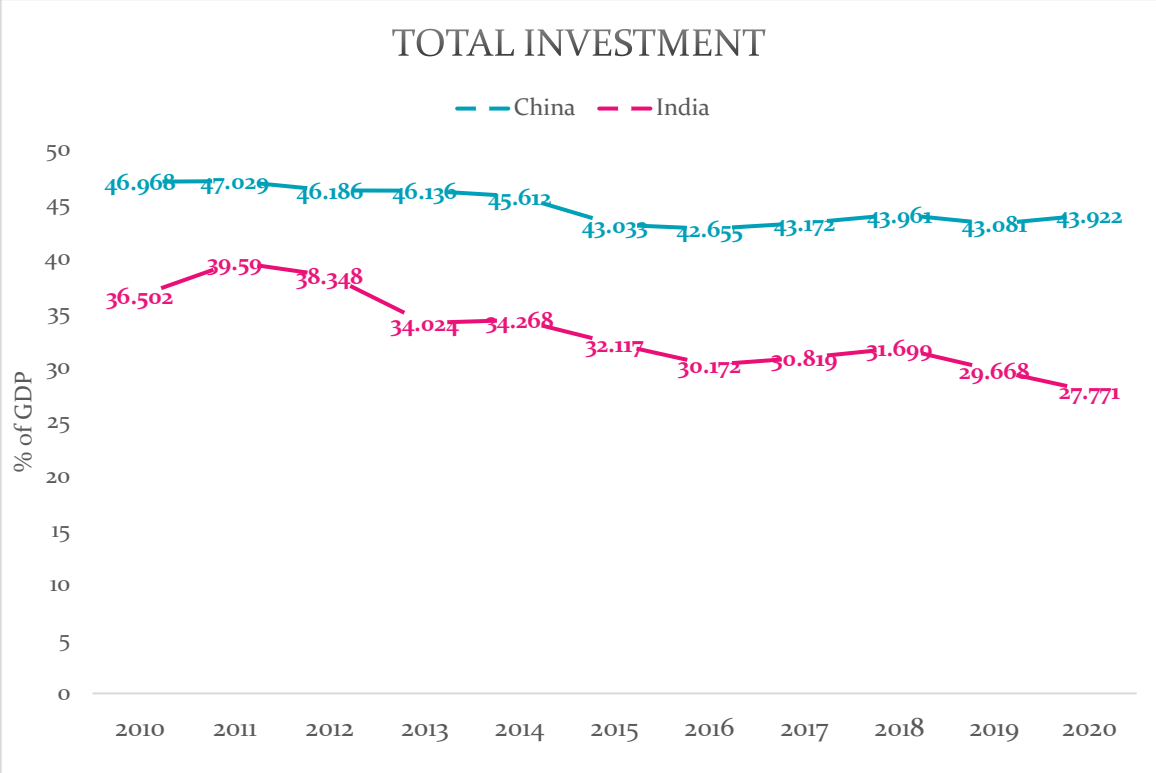
Average Percentage Change in Inflation

China	2.620951449
India	6.455699508

GROSS FIXED INVESTMENT

Gross fixed investment is defined as total business spending on fixed assets, such as factories, machinery, equipment, dwellings, and inventories of raw materials, which provide the basis for future production. It is measured gross of the depreciation of the assets, i.e., it includes investment that merely replaces worn-out or scrapped capital.

Subdued investment as a percentage of GDP has led lower India's GDP growth rate while China has maintained a high investment rate. Indian economy growth rate will rise when capital investment rises for which we will need bigger government and private spending.



GROSS NATIONAL SAVINGS

Gross national saving is derived by deducting final consumption expenditure from Gross national disposable income, and consists of personal saving, plus business saving, plus government saving, but excludes foreign saving. The figures are presented as a percent of GDP. A negative number indicates that the economy as a whole is spending more income than it produces, thus drawing down national wealth.

The national savings rate is an indicator of a nation's health as it shows trends in savings, which lead to investments. Household savings can be a source of borrowing for governments to provide funds for public works and infrastructure needs.

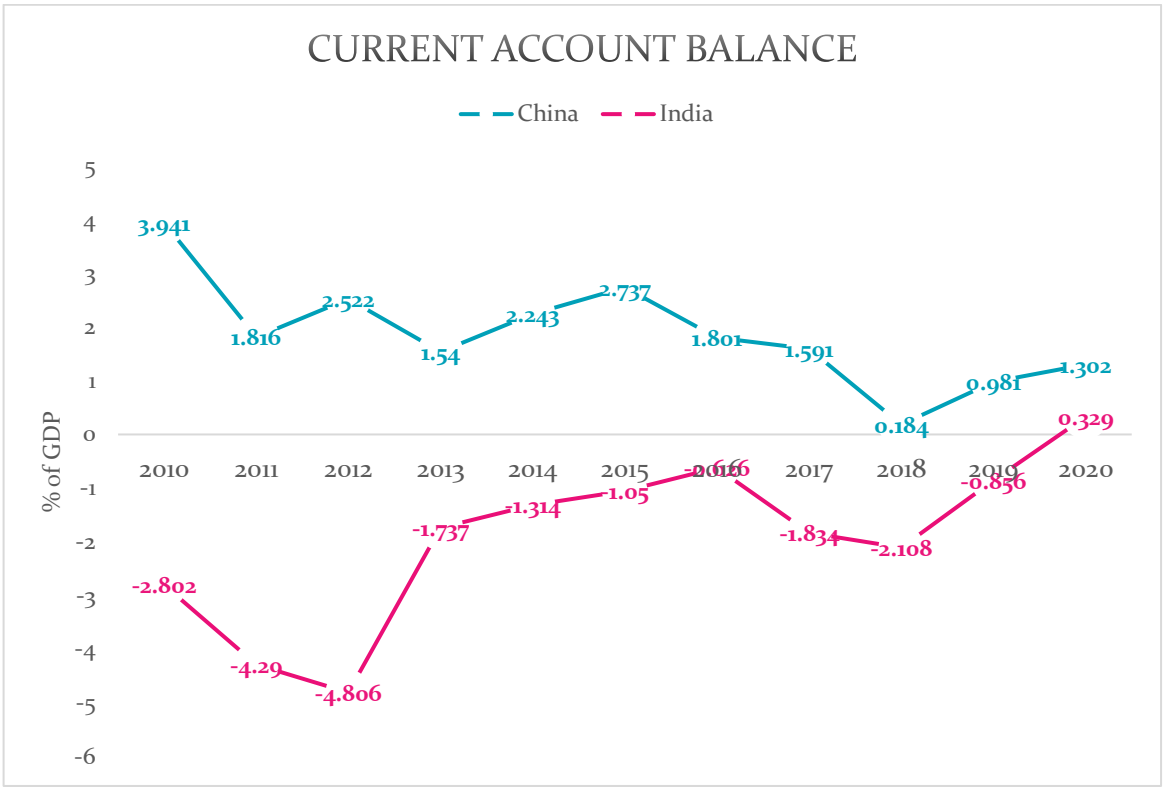
China's national savings have been considerably higher than India's.

CURRENT ACCOUNT BALANCE

The current account is an important indicator of an economy's health. It is defined as the sum of the balance of trade (goods and services exports minus imports), net income from abroad, and net current transfers. A positive current account balance indicates the nation is a net lender to the rest of the world, while a negative current account balance indicates that it is a net borrower from the rest of the world. A current account surplus increases a nation's net foreign assets by the amount of the surplus, and a current account deficit decreases it by that amount.

China has a clear advantage in this parameter, as it **ranked 2nd amongst countries with largest surplus** in current account balance, while India **ranked 3rd amongst countries with largest deficit in 2019.**

In 2020, for the first time in several decades, India is estimated to have a surplus in current account balance.



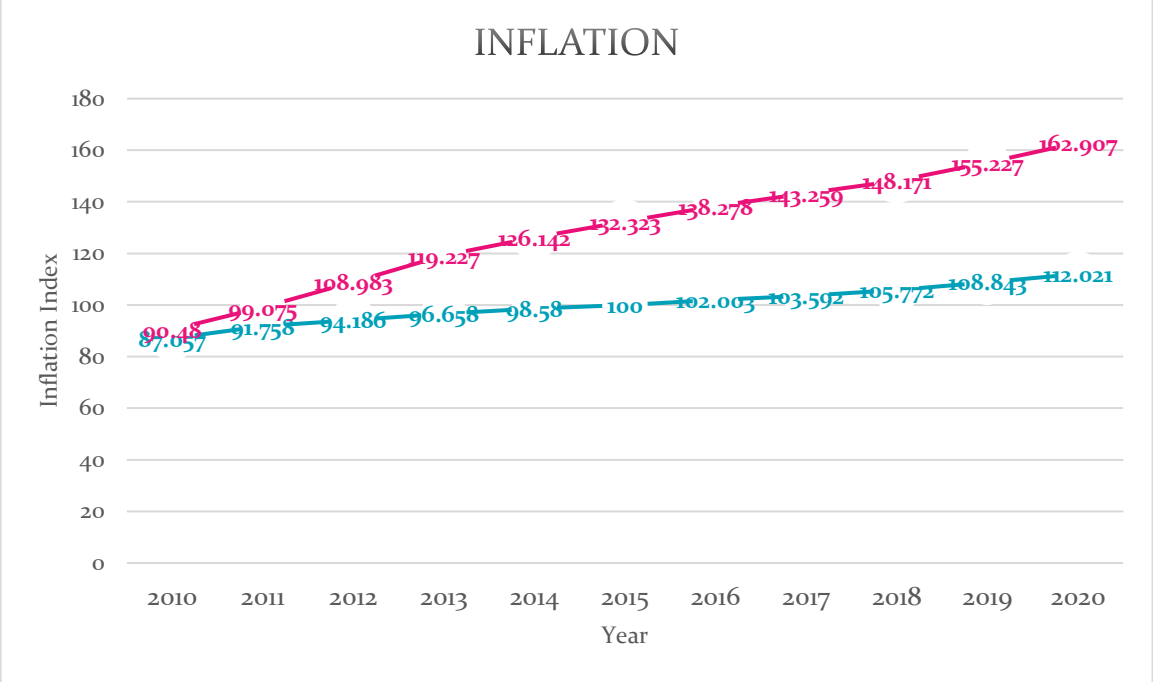
INFLATION

Inflation is one of the most important metrics in regard to an economy's strength.

I**nflation** (or less frequently, **price inflation**) is a general rise in the price level in an economy over a period of time, resulting in a sustained drop in the purchasing power of money. When the general price level rises, each unit of currency buys fewer goods and services; consequently, inflation reflects a reduction in the purchasing power per unit of money – a loss of real value in the medium of exchange and unit of account within the economy.

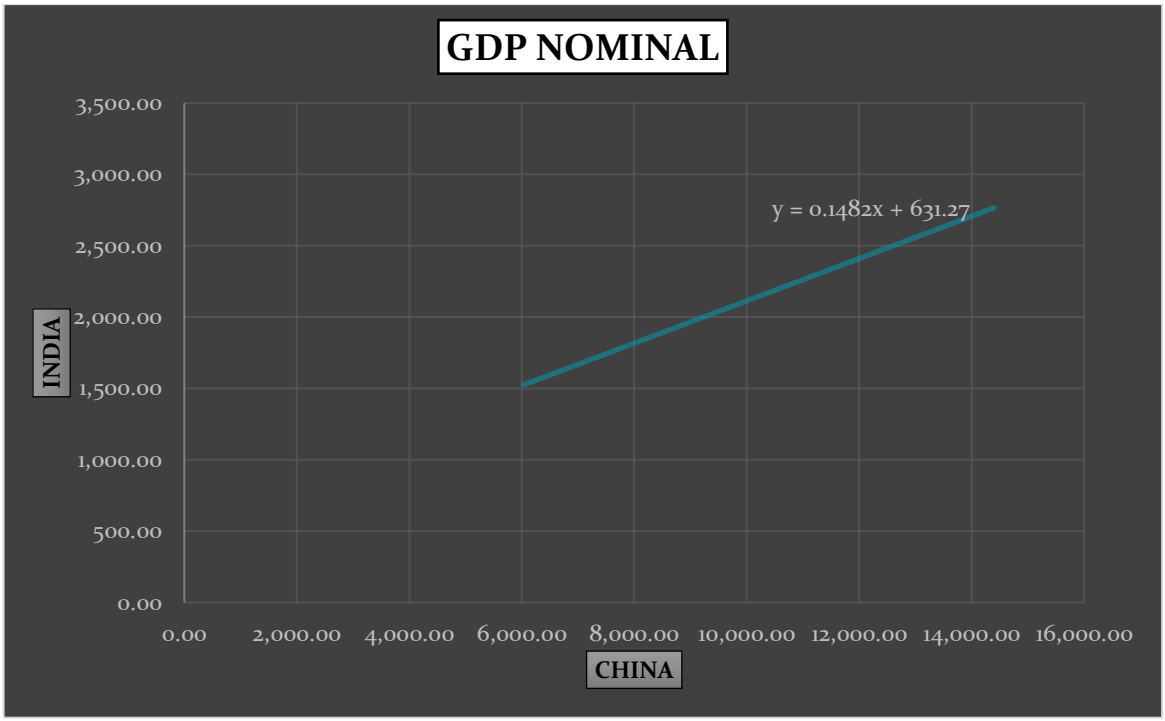
India's GDP growth has been accompanied by runaway inflation in the country. Growth rate accompanied by inflation cannot last for a long period of time. Instead, such growth rate is indicative of the short-term impetus that has been given to the economy by the monetary policy.

On the other hand, China's inflation has been relatively stable at a negligible 0.8% for many years. This has been accomplished despite the fact that China has been recording fiscal surplus for the past many years and ideally should be reeling with inflation. To the contrary, China has established sovereign wealth funds, which invest the additional cash in foreign assets keeping the inflation rate low.



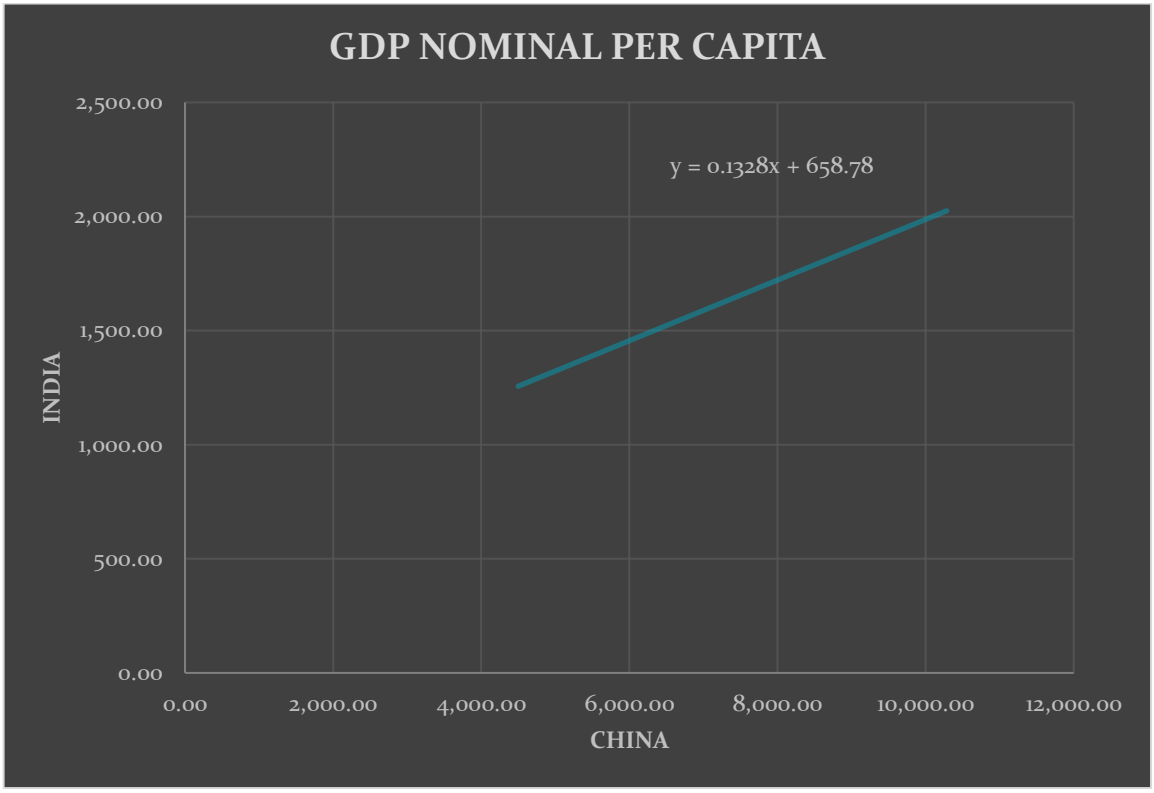
Regression and Correlation Analysis to Understand the effects of the 2020 Financial Crisis

ON GDP NOMINAL



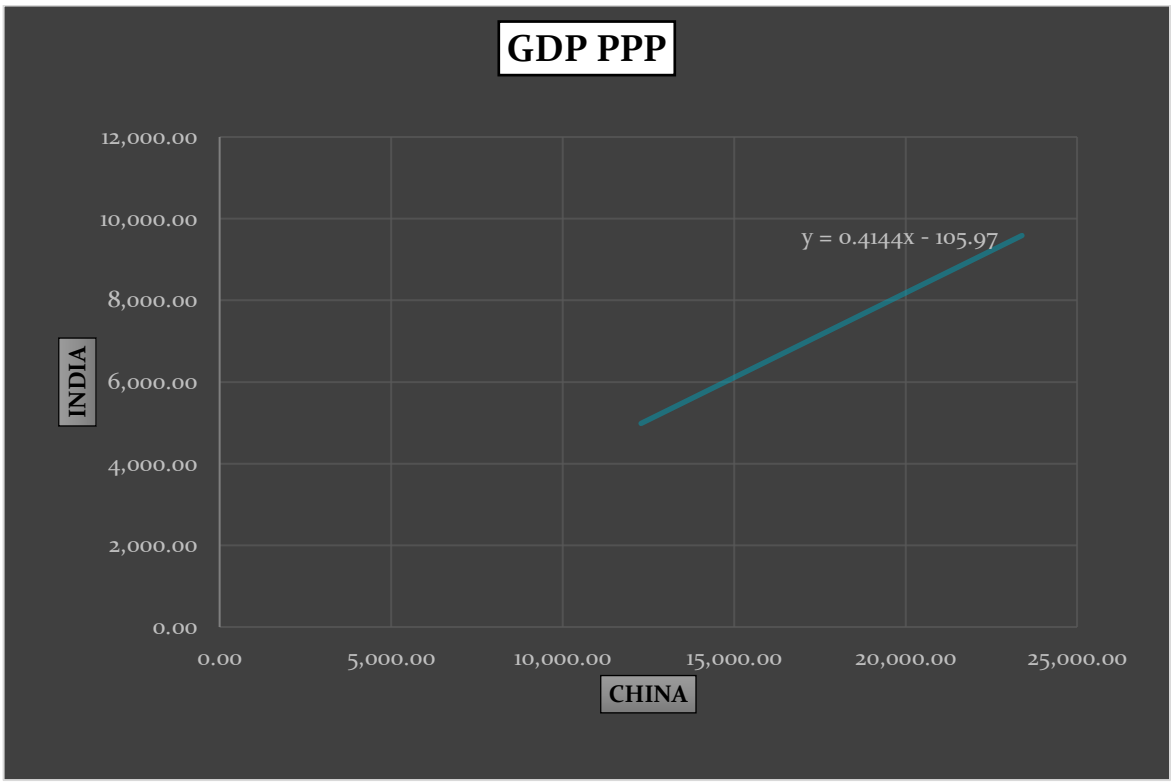
SD X	2530.137736
SD Y	399.8458431
KPCC	0.937777443
China 2020 GDP Nominal(x)	14,860.78
India 2020 GDP Nominal(y)	2,592.58
Y=0.1482x+631.27	2833.637596
% ERROR	-8.50700161

ON GDP NOMINAL PER CAPITA



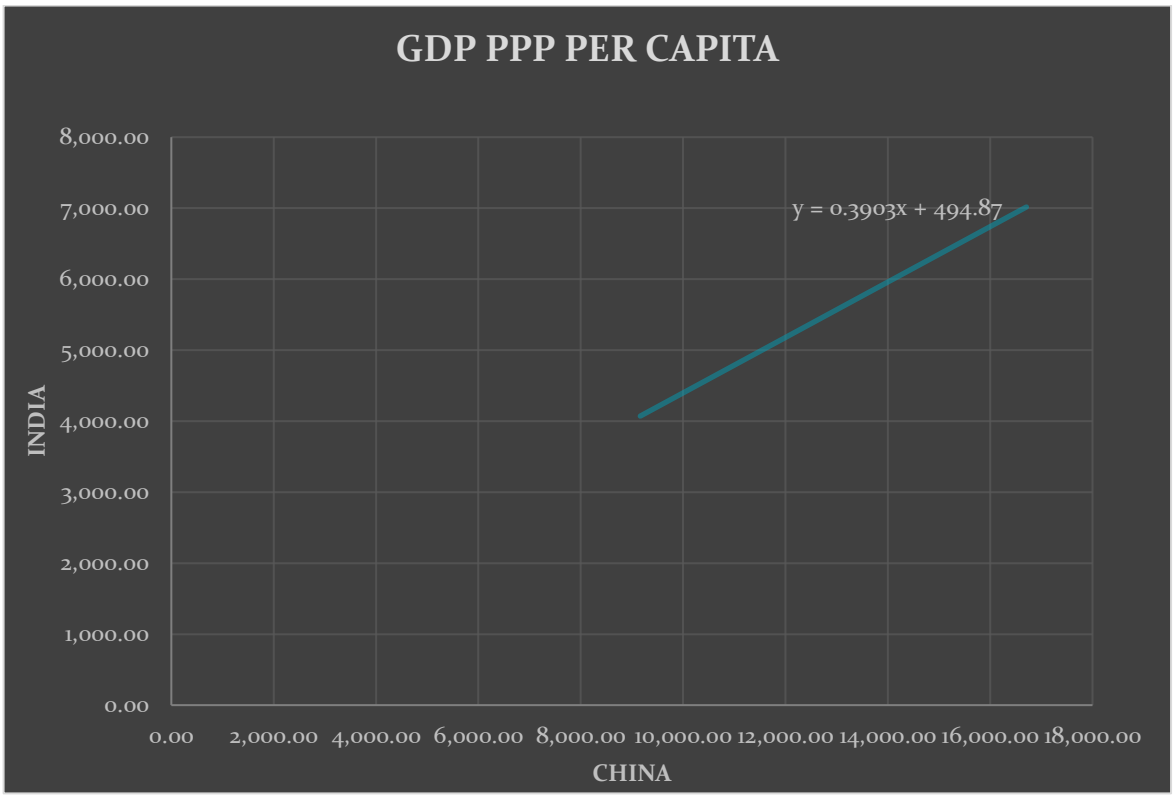
SD X	1741.154392
SD Y	252.2599078
KPCC	0.916615348
China 2020 GDP Nominal Per Capita(x)	10,582.10
India 2020 GDP Nominal Per Capita(y)	1,876.53
Y=0.1328x+658.78	2064.08288
% ERROR	-9.08649947

ON GDP PPP



SD X	3276.598066
SD Y	1364.918196
KPCC	0.994801185
China 2020 GDP PPP(x)	24,162.44
India 2020 GDP PPP(y)	8,681.30
Y=0.4144x+105.97	10118.88514
% ERROR	-14.2069518

ON GDP PPP PER CAPITA

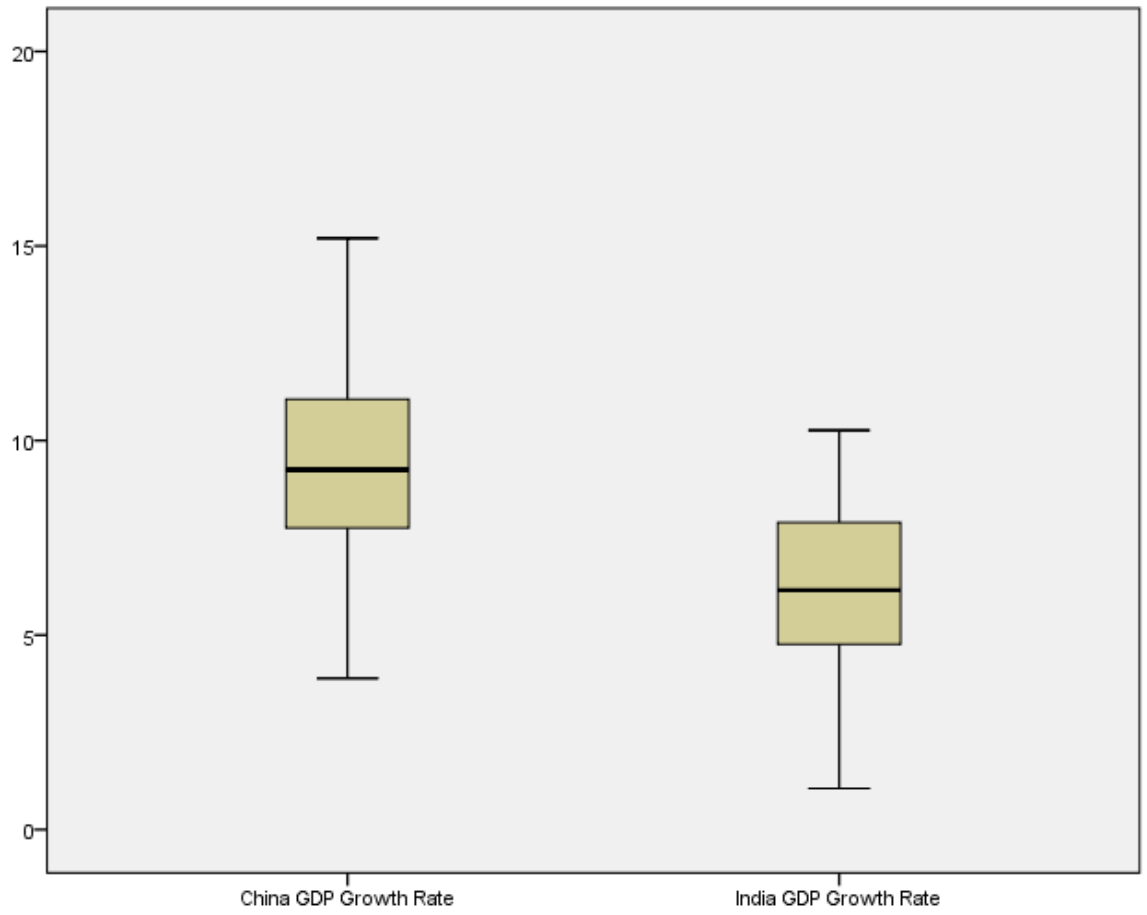


SD X	2208.199616
SD Y	867.4938834
KPCC	0.993505922
China 2020 GDP PPP Per Capita(x)	17,205.65
India 2020 GDP PPP Per Capita(y)	6,283.57
Y=0.3903x+494.87	7210.235195
% ERROR	-12.8520799

GDP GROWTH RATE

Descriptive Statistics

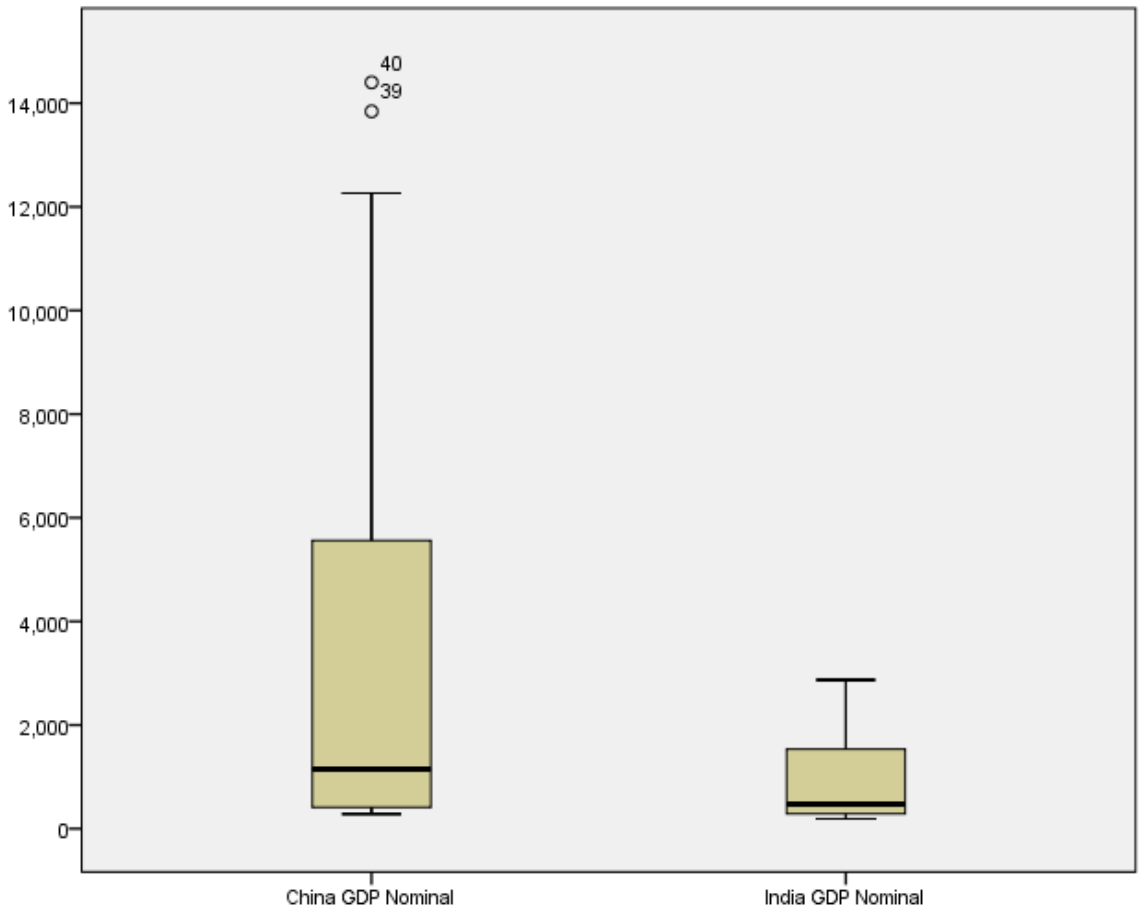
	N	Range	Minimum	Maximum	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
China GDP Growth Rate	40	11.312	3.888	15.200	9.43805	.432880	2.737774	7.495
India GDP Growth Rate	40	9.203	1.057	10.260	6.29587	.328765	2.079293	4.323
Valid N (listwise)	40							



GDP NOMINAL

Descriptive Statistics

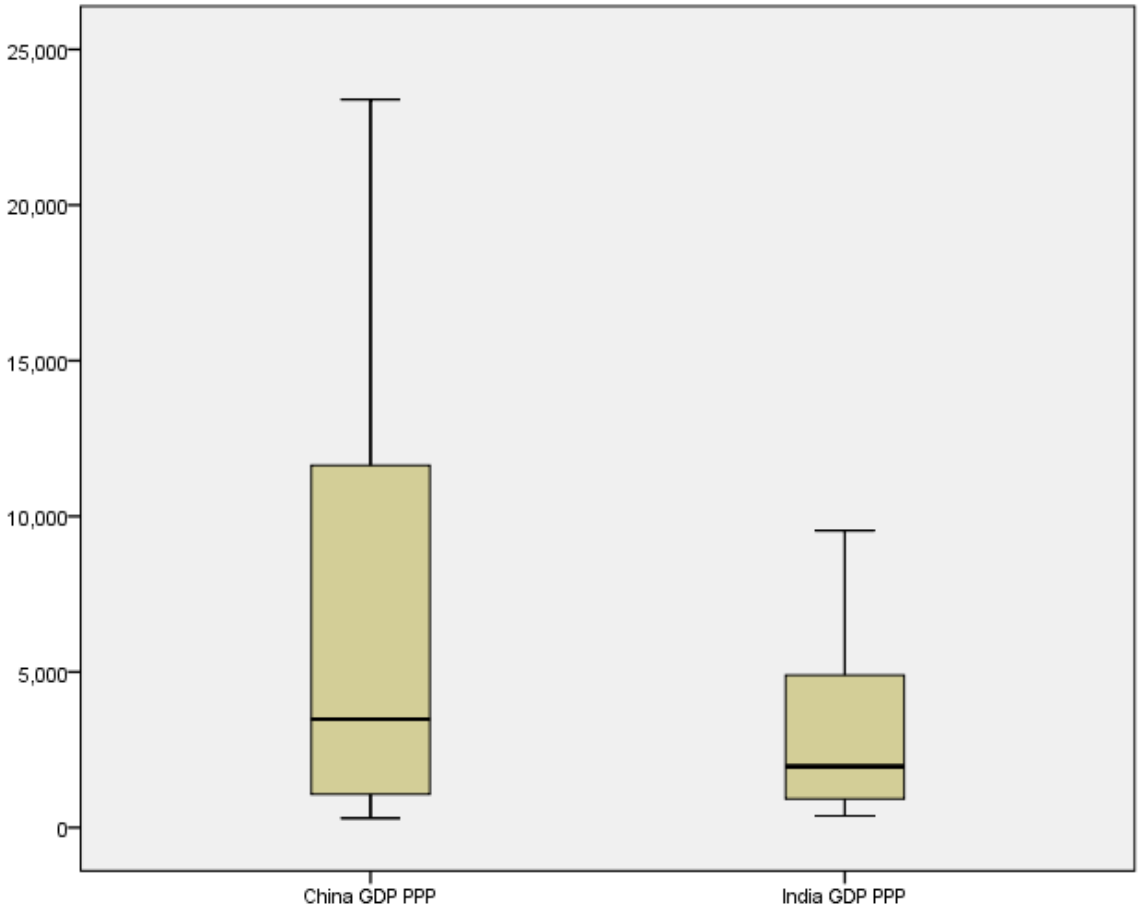
	N	Range	Minimum	Maximum	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
China GDP Nominal	40	14117.118	284.608	14401.726	3534.66953	697.602923	4412.028281	19465993.55
India GDP Nominal	40	2679.492	189.438	2868.930	908.31437	130.517374	825.464352	681391.397
Valid N (listwise)	40							



GDP PPP

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
China GDP PPP	40	23090.273	302.731	23393.004	6764.83905	1115.298580	7053.767569	49755636.91
India GDP PPP	40	9169.973	372.282	9542.255	3074.10038	429.077597	2713.725000	7364303.375
Valid N (listwise)	40							



T-TEST ON PAIRED DATA

DATA: 1980-2019

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	China GDP Growth Rate	9.43805	40	2.737774	.432880
	India GDP Growth Rate	6.29588	40	2.079293	.328765
Pair 2	China GDP Nominal	3534.66953	40	4412.028281	697.602923
	India GDP Nominal	908.31438	40	825.464352	130.517374
Pair 3	China GDP PPP	6764.83905	40	7053.767569	1115.298580
	India GDP PPP	3074.10038	40	2713.725000	429.077597

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	China GDP Growth Rate & India GDP Growth Rate	40	.102	.530
Pair 2	China GDP Nominal & India GDP Nominal	40	.989	.000
Pair 3	China GDP PPP & India GDP PPP	40	.999	.000

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	China GDP Growth Rate - India GDP Growth Rate	3.142175	3.264306	.516132	2.098199	4.186151	6.088	39	.000
Pair 2	China GDP Nominal - India GDP Nominal	2626.355150	3597.788020	568.860234	1475.726720	3776.983580	4.617	39	.000
Pair 3	China GDP PPP - India GDP PPP	3690.738675	4345.346435	687.059598	2301.029465	5080.447885	5.372	39	.000

Hypothesis Testing

The 1st country is China, 2nd is India.

GDP GROWTH RATE

Null Hypothesis **H_0: $\mu_1=\mu_2$** against Right-Tailed Alternative Hypothesis **H_1: $\mu_1>\mu_2$**.

Population mean of China's GDP Growth Rate is much higher than that of India. The mean difference is 3.142, while the standard deviation of the paired differences is 3.264. The 95% confidence interval of the mean of differences gives us a lower bound of 2.098 and an upper bound of 4.186.

The value of t and its corresponding p-value will allow us to interpret the result of our hypothesis testing. The p-value is <0.001, and therefore, p<0.05. This allows us to reject the null hypothesis and consider the right tailed alternative hypothesis H_1.

Thus, China's growth across the past 40 years has been higher than India's growth over the same period, and substantially so. China's mean growth rate has been 9.438% compared to India's 6.296%.

GDP NOMINAL

Null Hypothesis **H_0: $\mu_1=\mu_2$** against Right-Tailed Alternative Hypothesis **H_1: $\mu_1>\mu_2$**.

Population mean of China's GDP Nominal is much higher than that of India. The mean difference is 2626.355, while the standard deviation of the paired differences is 3597.788. The 95% confidence interval of the mean of differences gives us a lower bound of 1475.727 and an upper bound of 3776.983.

The value of t and its corresponding p-value will allow us to interpret the result of our hypothesis testing. The p-value is <0.001, and therefore, p<0.05. This allows us to reject the null hypothesis and consider the right tailed alternative hypothesis H_1.

Thus, China's GDP Nominal across the past 40 years has been higher than India's growth over the same period, and substantially so. The mean difference (China-India), is in fact higher than mean of India's GDP Nominal itself.

GDP PPP

Null Hypothesis $\mathbf{H_0: \mu_1=\mu_2}$ against Right-Tailed Alternative Hypothesis $\mathbf{H_1: \mu_1>\mu_2}$.

Population mean of China's GDP PPP is much higher than that of India. The mean difference is 3690.739, while the standard deviation of the paired differences is 4345.346. The 95% confidence interval of the mean of differences gives us a lower bound of 2301.29 and an upper bound of 5080.447.

The value of t and its corresponding p-value will allow us to interpret the result of our hypothesis testing. The p-value is <0.001, and therefore, p<0.05. This allows us to reject the null hypothesis and consider the right tailed alternative hypothesis H_1.

Thus, China's GDP PPP across the past 40 years has been higher than India's growth over the same period, and substantially so. The mean difference (China-India), is in fact higher than mean of India's GDP PPP itself.

Thus, after hypothesis testing, it is clear that in the past 40 years, China's GDP Growth Rate, GDP Nominal and GDP PPP have higher mean than those of India's, by using Student's t-test.

Conclusion

The **Asian Century** is the projected 21st-century dominance of Asian politics and culture, assuming certain demographic and economic trends persist. The major driver is continued productivity growth in Asia, particularly in China and India, as living standards rise. The global political position of China and to a lesser extent India has risen in international bodies and amongst the world powers, leading the United States and European Union to become more active in the process of engagement with these two countries.

However, there are several challenges to this concept. One of them, is the growing economic and geopolitical rivalry between India and China. Through this case study, we wished to understand the economic competition between the two countries, who's winning, and how.

After several economic indicators over the past 10 years, we found that the competition to be very one- sided, heavily in China's favour. China's continued higher growth rate in the past 40 years has allowed it take a sizable lead against India.

Possible indicators of China's higher growth rate include:

1. Higher Total Investment (as % of GDP)
2. Higher Gross National Savings
3. High and consistently positive current account balance (compared to India's consistently negative current account balance)

A Correlation and Regression Analysis exposed the contrasting effects of the Covid-19 Pandemic on the two countries. While India experienced its first recession on record, with an estimated contraction of 10.3%, China became the only major economy in the world to avoid recession, estimated to grow about 1.8% this year.

A more thorough analysis on 3 economic indicators: GDP Growth Rate, GDP Nominal and GDP PPP, over the past 40 years, and an attempted Hypothesis Testing clearly show the disparity in the economic growth of the two countries.

Descriptive statistical analysis as well as box-plots showcase the difference in the indicators between the two nations. In fact, China's growth has been so extraordinary, that on the box-plot of its GDP Nominal, 2018 and 2019 data points are outliers, which shows that they are much higher than they were expected to be based on the data of the previous 38 years.

A Hypothesis Test to show that India and China had similar economic growth was rejected on ground of all three indicators via t-test.

Instead, the right-tailed alternative hypothesis that China's growth was higher than India's was accepted in all three indicators.

The mean difference for (China-India) was also quite large. In fact, the mean difference for GDP Nominal and GDP PPP were larger than the mean of India's GDP Nominal and GDP PPP respectively, a testimony of China's immense lead over India.

Economists have suggested several policy changes and factors that could help India's economy grow at faster and more stable rate.

1. Higher Investment (as a % of GDP): This will allow higher investment in fixed assets, which will allow the means for future production.
2. Positive Account Balance: A positive account balance is a sign of healthy economy with high productivity
3. Higher Workforce Participation: India has the 2nd largest labour force in the world, soon to be largest. Higher participation of the labour force will result in higher productivity. This is especially important in the case of the female workforce, which has only 23% participation rate in India, compared to 60% in China. Thus, higher workforce participation will result in better growth of GDP per capita, leading to a better standard of living.
4. Economic Reforms for further Liberalisation: The Indian Economy had been protectionist since independence, and despite the neo-liberal reforms in 1991, there are still several barriers and tariffs that hinder trade and foreign investment(both incoming and outgoing).

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