MATHS PROJECT

India V/S China

SUBMITTED BY:

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INTRODUCTION

The effect of overpopulation on the economic, social and political progress of India as compared to China. China and India have the world's largest populations. On the basis of this condition, it's been quite evident looking at this parameter, that both of the countries are progressing and their rates differ. One excels in providing aid in one department and the other excels in the other.
The post Indian Independence scenario has been statistically harsh when it comes to the exponential population growth in both India and China, both being the most populated countries. Despite, China's growth being faster and more numerically, India is about to overtake China's population by 2022 as predicted by several sources. The population crisis is real and has affected both countries in countless ways. But, China has taken an underhand in utilising its population to grow stronger economically, socially and politically. Meanwhile, India's population is increasing but there hasn't been many steps taken to be able to utilise this scenario. In account of that, our study is going to provide a detailed comparison of both the countries' situations with the help of statistics, graphs and future predictions.

PROBLEM STATEMENT

The population crisis for India has been a struggle for both countries when it comes to social, economic and political scenes. There are places where China utilised this situation and hence, it progressed more. India, on the other hand didn't quite utilise at the right time and hence, the resulting situation has been varied. Therefore, there is a need for a study to show the long term contrasting outcomes of population between India and China.

OBJECTIVE OF THE PROJECT:

The population crisis for India has been a struggle for both countries when it comes to social, economic and political scenes. There are places where China utilised this situation and hence, it progressed more. India, on the other hand didn't quite utilise at the right time and hence, the resulting situation has been varied. Therefore, there is a need for a study to show the long term contrasting outcomes of population between India and China.

METHODOLOGY OF THE PROJECT

The method being used is straightforward:
1.Collection of data from various sources.
2.Plotting the graphs for both countries.
3.Deriving results from these graphs.
4.Using statistical knowledge and probability skills, derive more results and conclusions. Conclusions and predictions to be given.

ECONOMIC DEVELOPMENT

1)UNEMPLOYMENT RATE:

	Economy:Unemployment Rate	
YEAR	INDIA	CHINA
2004	9.2	10.1
2005	8.9	9.8
2006	7.8	9
2007	7.2	4.2
2008	6.8	4
2009	10.7	4.3
2011	9.8	6.5
2012	8.5	6.5
2013	8.8	4.1
2016	5	4
2017	8.8	4

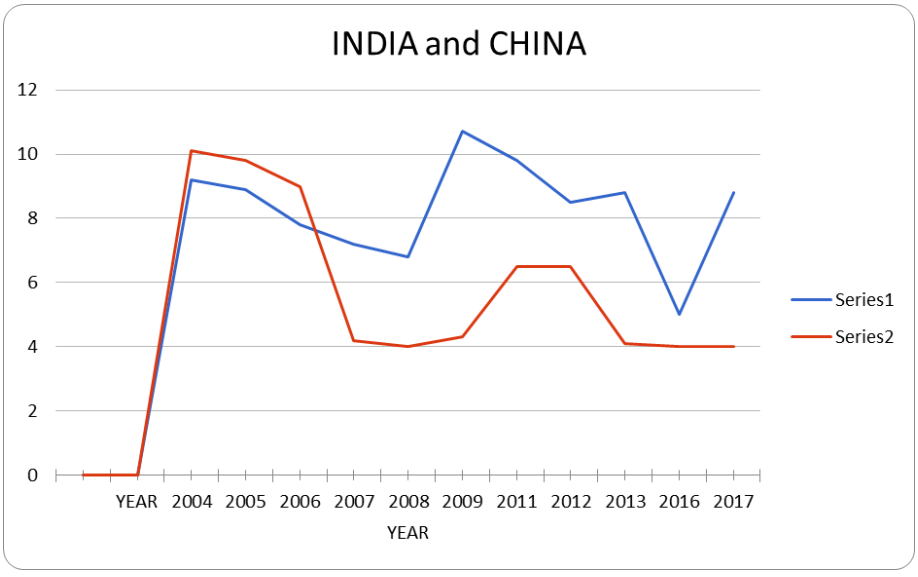


Fig 2.1:India and China Unemployment Rate in %

The above graph shows a comparison between the unemployment rates of the two countries,India and China. Even though China has a larger population than India still it

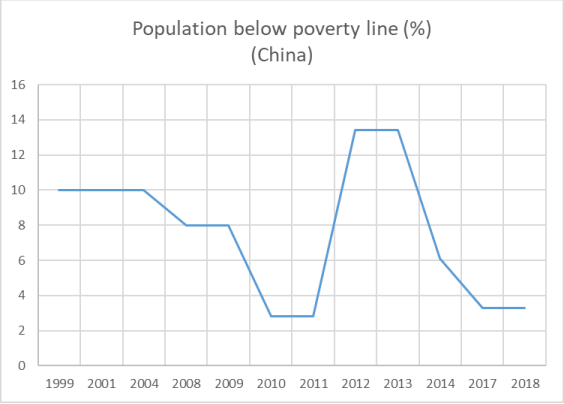
has a lower unemployment rate than India.In 2016,India saw a rapid decline in it's unemployment rate as compared to China. However,the unemployment rate of India grew back to 8.8% in 2017. China saw a great decrease in unemployment rate in 2007 unemployment rate falling from 9% to 4.2%.China successfully managed to keep it's unemployment rates low as compared to India.

AVERAGE	8.318181818	6.045454545
VARIANCE	2.431636364	6.246727273

Fig:Correlation Of China and India(UNEMPLOYMENT RATE)

2. PEOPLE BELOW POVERTY LINE

Poverty is a significant issue in India, despite being one of the fastest-growing economies in the world.The World Bank has been revising its definition and benchmarks to measure up poverty since 1990, with a $2 per day income on purchasing power parity basis as the definition in use from 2005 to 2013.
In 1981, nearly half the population were below the World Bank's poverty line. The percentage dropped to about 35% in 1994 and nearly 22% in 2011.
The only other major country to pull off poverty this drastically, is China. The percentage of people below the poverty line in China was 10% in 1999 and has reduced to 3.3% in 2018.



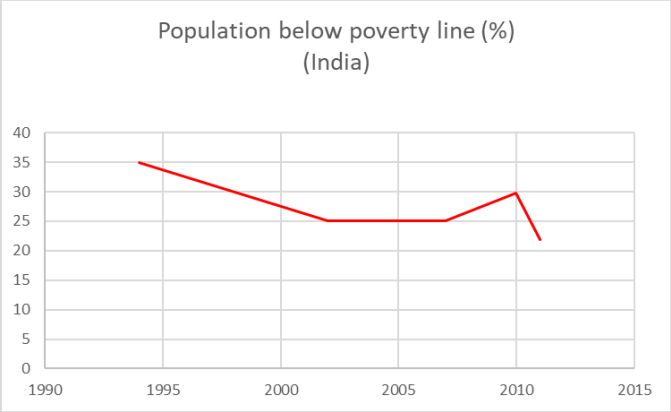


Fig China and India comparison of population below poverty line

3. INFLATION RATES

From the graph we can tell that inflation rate of India is more than China. India's

inflation rate from 1999 to 2004 was less which was gradually increasing till 2010 and again went down as the time passed, whereas china's inflation rate was never consistently increasing but instead was always inconsistent.

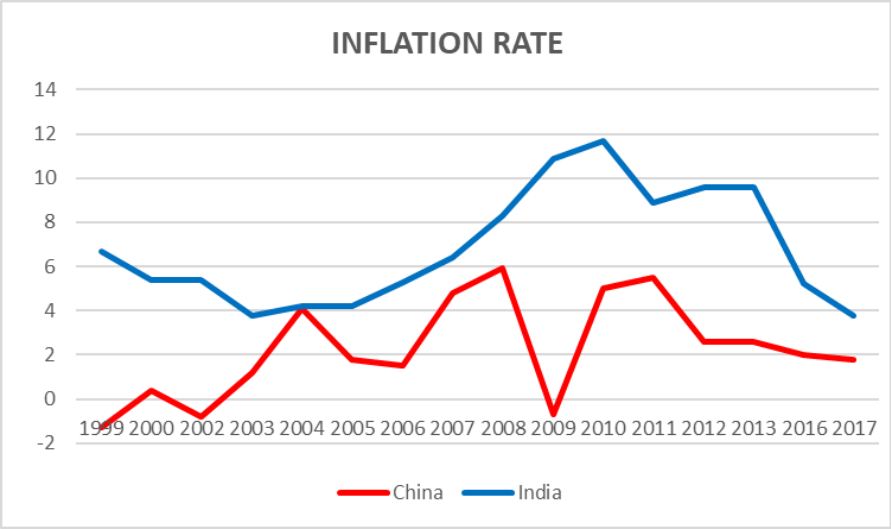


Fig: Inflation rates of China and India

4.GDP

The graph below shows the GDP in billions of US $. GDP is directly related to population of a country. Graph shows how China overtook India and ended up having such a drastic progression over the past 20 years.

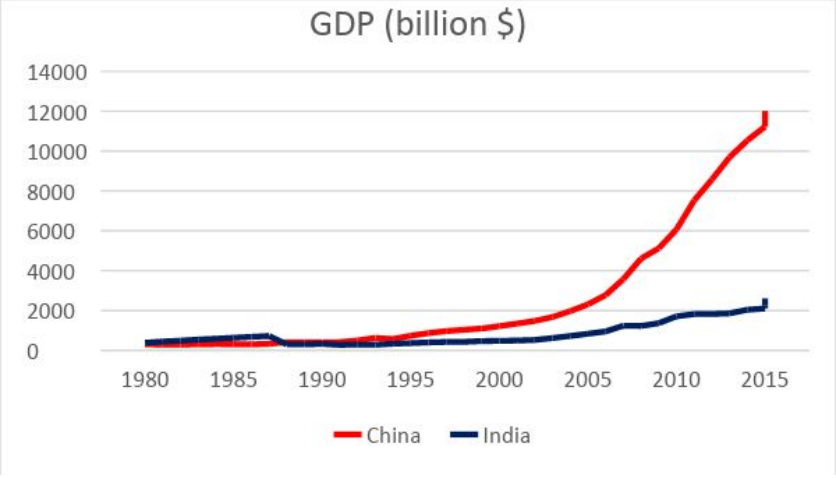


Fig: GDP comparison in billions

	MEAN	VARIANCE
China GDP	6159.98	68553385
INDIA GDP	1496.49	2484310

As, we can see the co-relation is positive. This suggest both China and India's GDP is rising with years. We'll use regression analysis later to project the predictions.

5. EXPORTS

When we compare about exporting of India and China, China's exporting is much more when compared to India. Gradual increase in exporting of China is increasing fast than that of India's, which was disturbed in 2008-2009 but was covered as the time passed. When we see India's exporting its growth is very slow time by time.

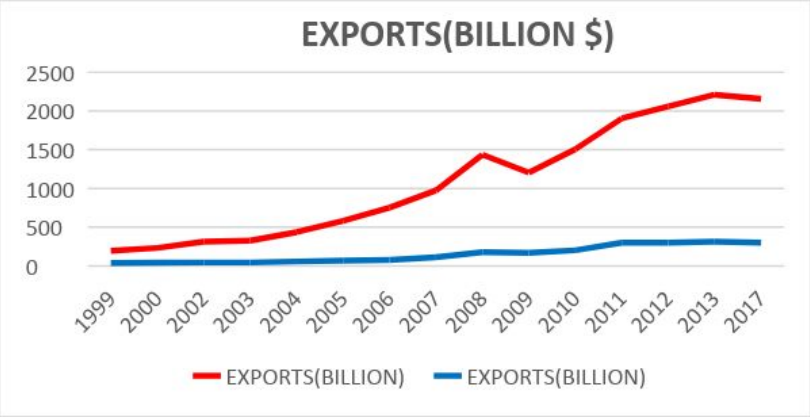


Fig: Exports comparison of China and India

6. IMPORTS

The more the population, more the demand of several products. Here, the graph shows how over the years the import has gone down. This is because of several Indian campaigns, which involves buying SWADESHI things and cutting down on foreign products imported from several places like China, USA, Japan, etc. On the contrary to India, China has imported a lot more suggesting the demand. The demand in India is much lesser.

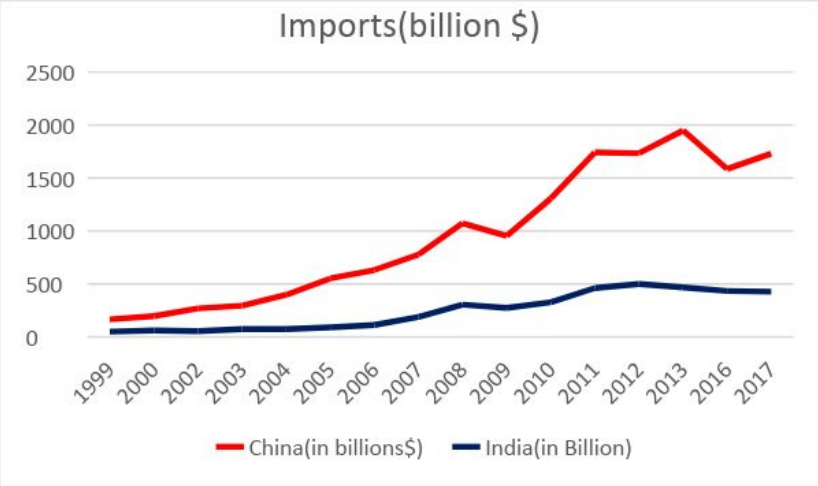
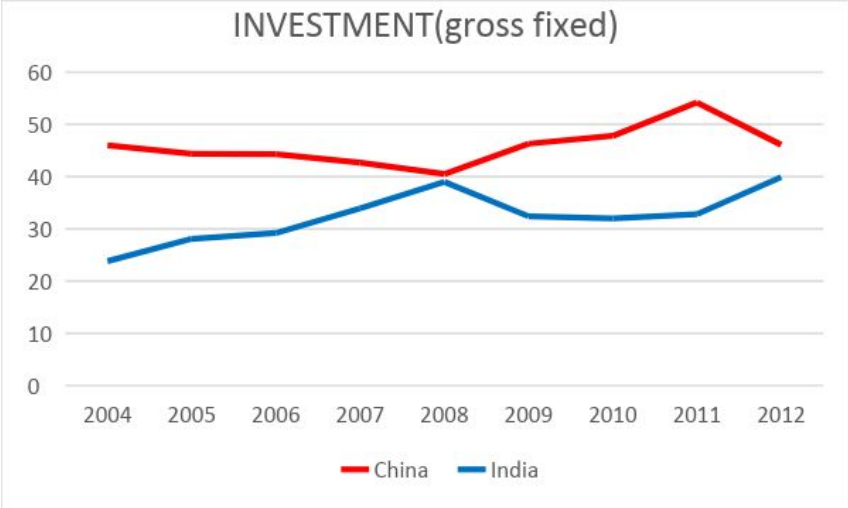


Fig: Comparison of Imports between China and India

7. INVESTMENTS



SOCIAL

8. LITERACY RATE

The literacy rate in India has seen a gradual increase over the years. While the literacy rate in China is higher than India the slope tells us that the increase has been more in case of China. The sudden decrease in slope is lesser in case of India which points to the consistency in increase in the literate population

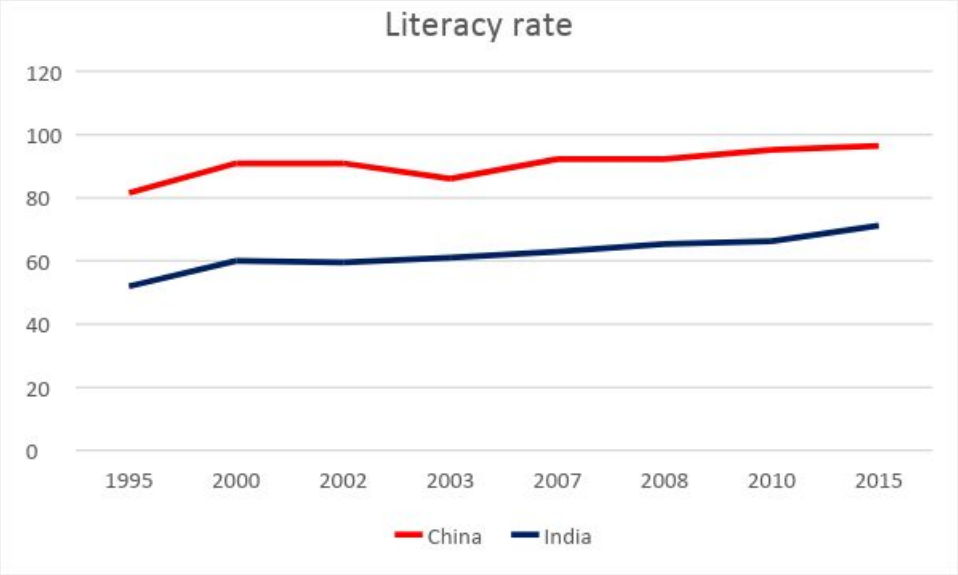


Fig: Comparison between Literacy rates

DEMOGRAPHIC

9.TRANSPORTATION (AIRWAYS)

China has a greater number of domestic airports than India. However, India has a greater number of International Airports as compared to the 3 International airports in China. According to the 2017 statistics, the Beijing International Airport is the second busiest airport in the world and Indira Gandhi International Airport is the sixteenth busiest airport in the world. From the above graph it can be clearly concluded that India's Airline transportation is growing at a faster rate than China irrespective of the population difference.

	TRANSPORTATION:AIRPORTS	
YEAR	INDIA	CHINA
1996	346	206
2000	337	489
2001	335	489
2002	334	500
2003	333	507
2004	333	472
2006	341	486
2007	346	467
2008	345	477
2010	352	502
2012	352	497
2013	346	507

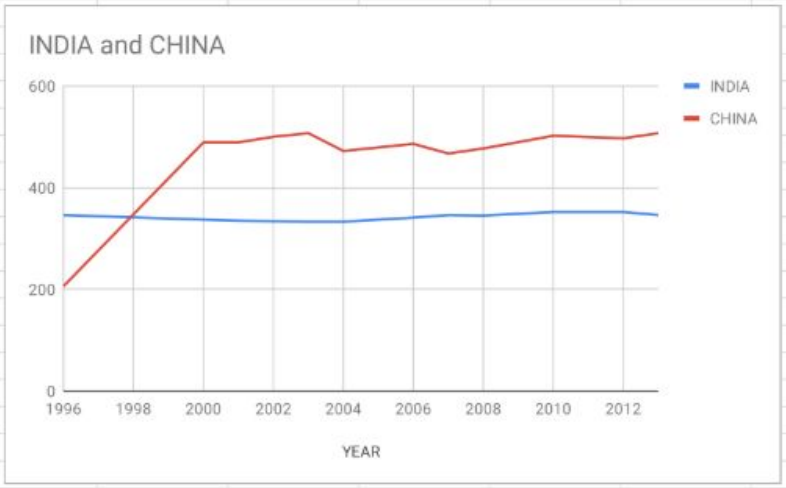


Fig: Data and graph above

AVERAGE	341.2727273	462.9090909
VARIANCE	53.61818182	7420.490909

10.TRANSPORTATION(RAILWAYS)

The graph below shows how India and China differs in relieving the traffic from the railway lines and establishing tracks connecting long distances. Here's a view of how population trafficking is handled when it comes to construction of railway tracks. Clearly, China here takes a lead.

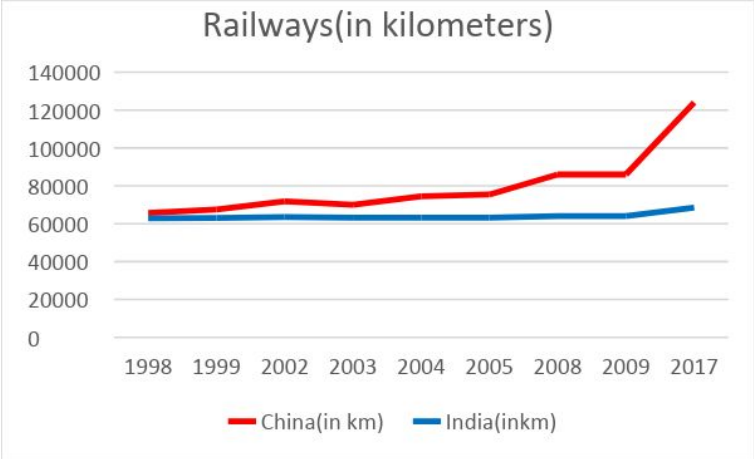


Fig:Comparison of Indian and Chinese Railways

11.DEMOGRAPHY

China has the largest population of 1.37 billion in the world.India follows China being the second being the second most populated country with a population of 1.28 billion.With median age of 26.7
India is younger than China of 37.0.Population density of India is 440.29 person per square km compare to 148.81 of China. So, India is 2.96 times more dense than China. China is 4th and India is 7th largest country in terms of area. It is predicted than India will cross the population of China by 2022 and become the country with the largest population in the world.

	DEMOGRAPHICS:POPULATION	
YEAR	INDIA	CHINA
2000	1,014,004,000	1,261,832,000
2001	1,029,991,000	1,273,111,000
2002	1,045,845,000	1,284,304,000
2003	1,049,700,000	1,286,975,000
2004	1,065,071,000	1,298,848,000
2005	1,080,264,000	1,306,314,000
2006	1,095,352,000	1,313,974,000
2007	1,129,866,000	1,321,852,000
2008	1,147,996,000	1,330,045,000
2009	1,166,079,000	1,338,613,000
2010	1,173,108,000	1,330,141,000
2011	1,189,173,000	1,336,718,000
2012	1,205,074,000	1,343,240,000
2013	1,220,800,000	1,349,586,000
2014	1,236,345,000	1,355,693,000
2016	1,266,884,000	1,373,541,000
2017	1,281,936,000	1,379,303,000

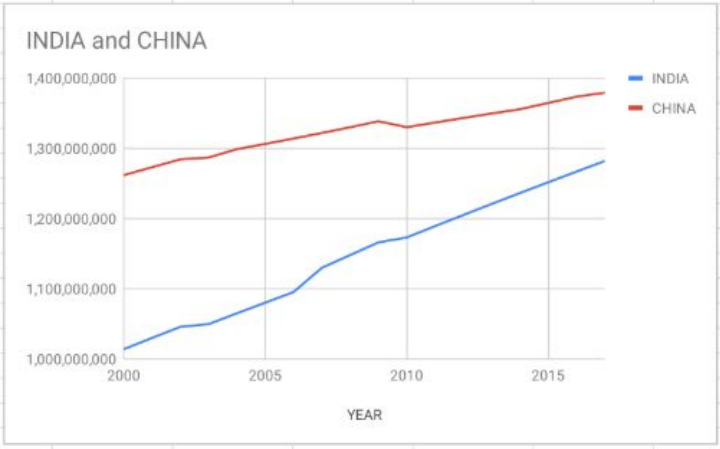


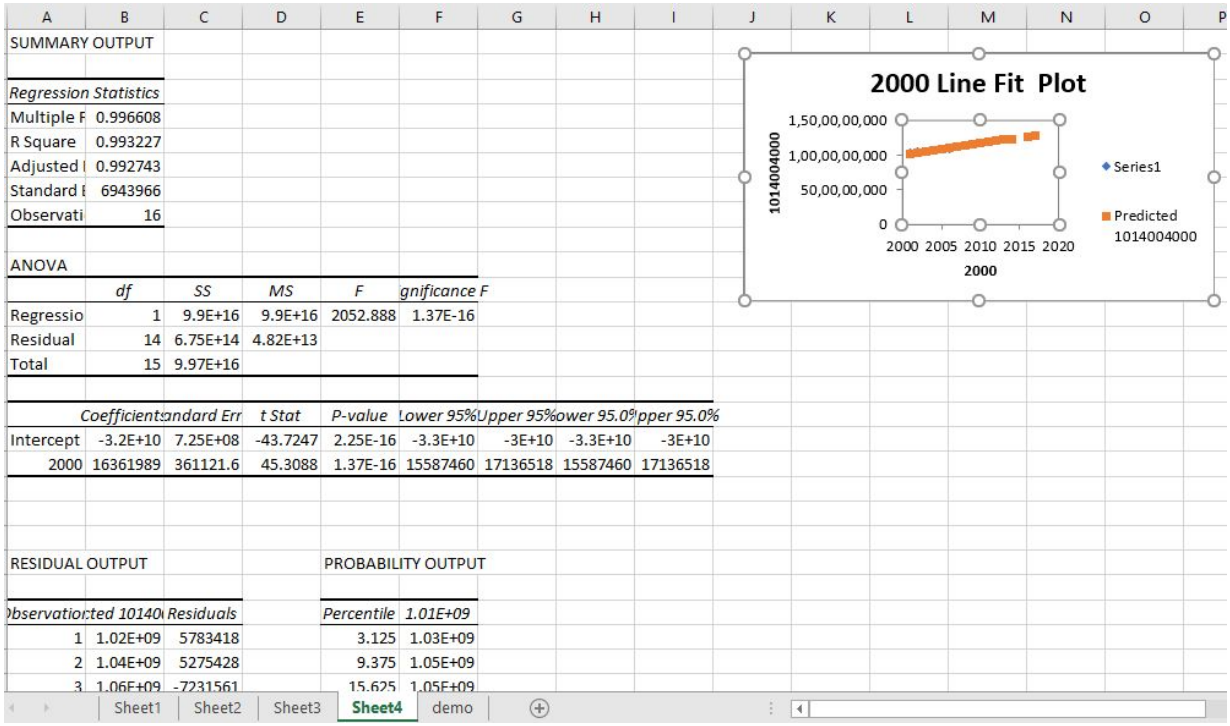
Fig : Comparison of India and China's population

AVERAGE	1,141,028,706	1,322,593,529
AREA	2,973,193	9,326,410
NO. OF PEOPLE/SQ.KM	383.7721621	141.8116434
VARIANCE	7.30039E+15	1.1506E+15

POPULATION PREDICTION

We ran linear regression for predicting the population of india and China and when they'll surpass each other.

Here's for India:



SUMMARY OUTPUT

Regression Statistics	
Multiple F	0.996608
R Square	0.993227
Adjusted I	0.992743
Standard E	6943966
Observati	16

ANOVA

	df	*SS*	*MS*	*F*	*gnificance F*
Regressio	1	9.9E+16	9.9E+16	2052.888	1.37E-16
Residual	14	6.75E+14	4.82E+13		
Total	15	9.97E+16			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*pper 95.0%*
Intercept	-3.2E+10	7.25E+08	-43.7247	2.25E-16	-3.3E+10	-3E+10	-3.3E+10	-3E+10
2000	16361989	361121.6	45.3088	1.37E-16	15587460	17136518	15587460	17136518

RESIDUAL OUTPUT

)bservatio	*cted 10140*	*Residuals*
1	1.02E+09	5783418
2	1.04E+09	5275428
3	1.06E+09	-7231561

PROBABILITY OUTPUT

Percentile	*1.01E+09*
3.125	1.03E+09
9.375	1.05E+09
15.625	1.05E+09

Here's for China:

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.987561
R Square	0.975276
Adjusted R Square	0.97351
Standard Error	5058019
Observations	16

ANOVA

	df	SS	MS	F	gnificance F
Regression	1	1.41E+16	1.41E+16	552.2592	1.2E-12
Residual	14	3.58E+14	2.56E+13		
Total	15	1.45E+16			

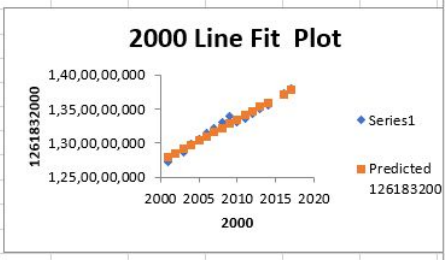
	Coefficients	andard Err	t Stat	P-value	Lower 95%	Upper 95%	ower 95.0%	pper 95.0%
Intercept	-1.1E+10	5.28E+08	-20.9897	5.58E-12	-1.2E+10	-1E+10	-1.2E+10	-1E+10
2000	6181557	263042.8	23.5002	1.2E-12	5617386	6745728	5617386	6745728

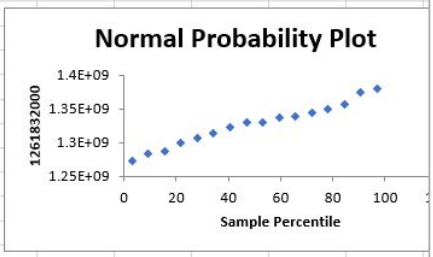
RESIDUAL OUTPUT

Observation	cted 12618	Residuals
1	1.28E+09	-6145752
2	1.29E+09	-1134309

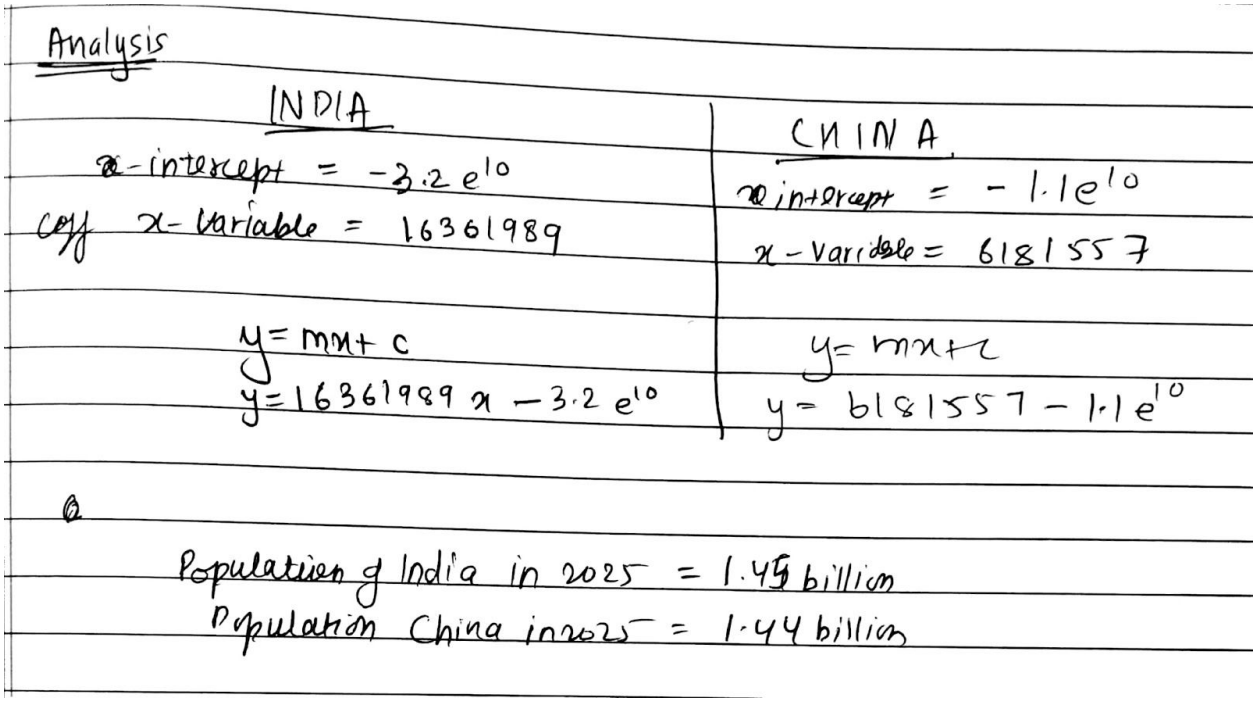
PROBABILITY OUTPUT

Percentile	1.26E+09
3.125	1.27E+09
9.375	1.28E+09





Prediction:



India and China are expected to have roughly a population of 1.44 billion each. After that, India's population is projected to continue growing for several decades to around 1.5 billion in 2030 and approaching 1.66 billion in 2050, while the population of China is projected to remain stable until the 2030s, after which it may begin a slow decline.

GDP ANALYSIS

It's like peeling an onion.

At the outermost layer, a country's GDP is the product of its population and its GDP per capita.

At the next layer, GDP per capita depends on the number of hours worked per capita; the skills embodied in the labor force as a result of past education and training; the quantity and quality of private physical capital that each worker is equipped with (the result of past investments); the quantity and quality of public infrastructure; and (most important of all) the productivity with which all those productive resources are applied.

One layer below that, productivity depends on technical knowledge as well as on the incentives created by a country's laws, regulations, policies, and institutions like the enforcement of property rights and the rule of law.

Below that lie political institutions, history, and culture.

THEORY RELATED

(1) Y = C + I + G + (X − M)

and

(2) Y = C + S + T

Both are equal. The symbols mean : C is consumption spending, I is private investment spending, G is government spending, X is exports and M is imports (so X − M = net exports) and S is total saving and T is total taxation (the other variables are as previously defined).

Combining both we get the equality of conservation of money

(G − T) + (X − M) = (S-I)

created deficit-net imports = net private savings.

Created money is the source of economic prosperity. Created money is called fiscal deficit = Vertical money created at zero cost = free money. For prosperity,

(3) **{Vertical money - net imports } should be positive.**

Here's the data for India:

YEAR	GDP	Imports	Exports	Total Spending	Current account balan	Investments
2000	476.64	50.2	43.1	185233	6.1	20.7
2001	493.93	60.8	44.5	211260	5.8	21.3
2002	523.77	53.8	44.5	224866	5.2	22.8
2003	618.37	74.15	57.24	263755	5	24
2004	721.59	74.15	69.18	307509	4.897	23.8
2005	834.22	89.33	76.23	328265	-12.95	28.1
2006	949.12	113.1	112	360616	-26.4	29.2
2007	1238.7	118.3	176.4	398879	-12.11	33.9
2008	1224.1	166.4	168.2	426132	-37.51	39
2009	1365.37	274.3	201	463831	-26.63	32.4
2010	1708.46	327	299.4	501083	-51.78	32
2011	1823.05	461.4	298.4	570185	-41.4	32.8
2012	1827.64	500.4	313.2	688909	-80.15	39.9
2013	1856.72	467.5	299.3	864530	-74.79	41.3
2014	2039.13	433.7	288.5	992442	-56.72	43.5
2015	2102.39	426.8	277	1164728	-59.45	42
2016	2273.56	473.5	314.4	1288763	-20.86	47
2017	2611.01	428	299.3	1497636	-33.68	46.5

Here’s data for China

CHINA:	YEAR	GDP	IMPORTS	EXPORTS	TOTAL SPE	CURRENT .	INVESTMENTS
	2000	1214.92	165.8	194.9	2000000	27.4	43.4
	2001	1344.08	197	232	2300000	28.4	42.6
	2002	1477.5	268.6	312.8	2700000	25.4	44.5
	2003	1671.07	295.3	325.6	3800000	37.3	41.2
	2004	1966.24	397.4	436.1	4360000	30.32	46
	2005	2308.8	552.4	583.1	4780000	160.8	44.4
	2006	2774.29	631.8	752.2	5200000	179.1	44.3
	2007	3571.45	777.9	974	5567000	371.8	42.7
	2008	4604.29	1074	1435	6500000	426.11	40.5
	2009	5121.68	954.3	1204	7800000	297.1	46.3
	2010	6066.35	1307	1506	9000000	305.4	47.8
	2011	7522.1	1743	1904	11500000	201.7	54.2
	2012	8570.35	1735	2057	13000000	213.8	46.1
	2013	9693.03	1950	2210	14000000	182.8	49.5
	2014	10534.53	1587	2157	15500000	196.4	53.8
	2015	11226.19	1731	2003	17900000	162.5	52.2
	2016	11221.84	1542	2103	19000000	188.3	56.4
	2017	12014.61	1781	2139	21000000	165.4	48.4

Code:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import statsmodels.api as sm
import seaborn as sns
sns.set()

data = pd.read_csv(r'F:Book1.csv')

y = data['GDP']
x1 = data[['GDP','Imports','Exports','Total Spending','Current account balance','Investments']]

x = sm.add_constant(x1)
reg_log = sm.Logit(y,x)
results_log = reg_log.fit()
results_log.summary()
print('Results verified')
```

From this code, we get the summary for Indian Data. Similar is repeated for data

of China.

After, running the two codes we get the coefficients of x- variable and y-intercept.

CONCLUSION

We were able to complete the tasks stated. Economically, we compared the GDP and ran its analysis using PYTHON. We also did analysis on the population to predict the population of both India and China. We ran regression using excel.

Apart from that, we also collected data from different sites and using statistics, showed how each country differs from others.

At the end, we can say that both India and China are progressing differently. One is good in one department, the other in the different department.