A New Way To Look At The Relationship Between Economic and Human Development

Aditya Gupta
New York University
New York, NY USA
ag44792@nyu.edu

Shikuan Huang
New York University
New York, NY USA
sh2514@nyu.edu

Xiangbo Liang
New York University
New York, NY USA
xl1129@nyu.edu

***Abstract*—**

To better measure and understand a country's level of development, both economic and social factors need to be considered. We develop a social index and an economic index from various data for each country that measures its social development and economic development respectively. With both of these indices, we create an aggregate index that measures each country's overall level of development.

Keywords—analytics; social development; economic development; human development

I. INTRODUCTION

Historically a country's level of development is measured based on its economy – GDP, GDP Per Capita, GNI, just to name a few. While there is merit in measuring a country's level of development by economic indicators like GDP, economic indicators do not capture the whole picture. While some countries have high economic development in all economic measurements, the people living in some of these countries are not living a life that you would expect of their country's level of economic development. Their living conditions may not be on par with other countries with the same level of economic development. Yet these countries' development levels are ranked similarly.

Many important contributing factors to a country's development are not included in traditional economic measurements. Quite evidently, to better understand a country's level of development, we need to consider both the economic and social aspects of a country. The economic factors will tell us how well a country is doing in terms of overall wealth, as they traditionally have been doing. The social factors will tell us about the quality of life of the people. Do people have the necessities for a good life? Do they have what it takes to improve their life and to make the most of it? To this end, we intend to develop a new development index from both the economic and social perspectives.

II. MOTIVATION

Countries often want to know how well they are doing as a whole and how they are doing relative to other countries. Often they need to look at some kind of index, indicator, or ranking to be able to determine this. As mentioned, the traditional means of doing this is by looking at economic indicators, but this only offers partial information. In addition to economic indicators, our development of a new index that include social factors will more accurately determine how well each country is doing – both of which are very important in highlighting what countries should probably invest more time in in improving. Countries will be able to access it's strengths and its weaknesses. Countries of high development can act as role models, and other countries can try and adapt similar policies to improve its own development level. With this index we hope to possibly change countries' emphasis on economic measurements as the primary means of accessing its development and for them to include the social factors that affect the everyday lives of people in their assessment.

III. METHODOLOGY

To better assess a country's overall level of development, both the economic and social aspects of a country needs to be considered. Let us first outline the steps in our study before providing a detailed step through: first, we decide and gather what data to include in our indices. With the data, we create two indices for each country where the data is available – an economic index and a social index that measures each country's economic development and social development respectively. An aggregate index consisting of the two derived indices is created to indicate a country's overall level of development.

Our first step is to decide what data to include in our indices. We have to decide what is important in determining a country's level of economic and social development. What should we include that offers insight into how each country is doing. An important factor in deciding what data to include is how much data can we obtain for each country? We want to maximize the number of countries that our results will include, but at the same time maintaining the merit and legitimacy of our indices by keeping data that matters and is important. We chose to include 17 economic indicators that were available for 165 countries and 23 social indicators that were available for

128 countries. We used the open economic and social data provided by the World Bank and the United Nations Development Programme.

We chose to use a composite index for the following reasons:

1. A composite index like our composite index has the ability to summarize complex or multidimensional issues in a simple manner, making it easier for policy makers and different governments to analyze where they stand with respect to other countries in the field of human and economic development. It is easier to look at the value of human development index and analyze where a country stands with respect to human development than go through a series of indicators. [10]
2. Instead of having many indicators to measure progress, a single composite index makes it more convenient to evaluate progress. There is a substantive ease in interpretation when we use a composite index. This helps in tracking progress, strengths, and weaknesses over a period of time [10].
3. When quantifying something, it becomes easier to track it's progress or lack of progress. It can be a great starting point for a development conversation between various stakeholders, politicians, policy makers, and ordinary citizens.

Economic Indicators

In our economic indicators, we tried to include in it as many indicators as possible that will give us a better perspective on each country's economic situation. We chose as many indicators that directly affects a country's economy. The following table shows the categories we divided our economic indicators into:

Economic Indicators	
Gross Domestic Product (42.5 Points)	1. Total GDP *(10 Points)* 2. GDP Per Capita *(17.5 Points)* 3. Total GNI *(5 Points)* 4. GNI Per Capita *(5 Points)* 5. GDP Growth *(5 Points)*
Inflation (12.5 Points)	9. Consumer Price Inflation *(12.5 Points)*
Reserves (10 Points)	10. Total Reserve *(10 Points)*
Industry, Agriculture, and Services (10 Points)	11. Industry Added Value *(3 Points)* 12. Agriculture Added Value *(1 Points)* 13. Services Added Value *(6 Points)*
Trade (10 Points)	14. FDI *(6 Points)* 15. Trade In Services *(4 Points)*
Gross Saving (5 Points)	16. Gross Saving *(5 Points)*
Ease of Doing Business Index (5 Points)	17. Ease of Doing Business Index *(5 Points)*

Table 1: Economic indicators used to derive the Economic Development Index. All the indicator data was derived from the World Bank. The points at the end of each indicator indicates how many points within each category that indicator make up.

The most comprehensive measurement of overall economic performance is Gross Domestic Product (GDP) because it concerns the output of different sectors of the economy. It gives an indication of the total value added to the economy. GDP is a comprehensive measure of market activity that is useful for a wide variety of purposes, such as measuring productivity, conducting monetary policy and projecting tax revenues. A significant change in GDP also has a huge impact on the stock market. Amongst the different GDP variants, we put the most emphasis on GDP per capita as it measures the productivity with respect to each citizen individually. GDP per capita is more important of an indicator than GDP because large countries in most cases will have a higher value of GDP than smaller countries, but that does not necessarily mean that the citizens of these larger countries are more productive. We have to look at how productive a country is when considered over its population [11][12].

In this world of globalization and economic liberalization, trade is an important indicator of overall economic health. It enables the free exchange of goods, services, capital, and technology. It enables domestic producers to take advantage of the foreign markets and to import goods which may be really important for a country, such as oil. Although the effects of foreign direct investment (FDI) are largely positive there might be certain cases in which foreign direct investment may have negative effects on the economy. The fact that a country is receiving a lot of FDI is a positive sign since it shows that a lot of investors are willing to invest in the economy and the country that is invested in is an investor friendly destination.

Indicators like current account balance, savings, reserves, and the value added by the different sectors in the economy adds to the holistic overview of economies. A country with high savings will have the funds required to invest in different social schemes. The countries with high positive current account balance value points towards a healthy economy.

One of the most important economic indicators in any economy is inflation. Inflation has a huge impact on everyday lives of people as it directly determines the purchasing power of the people in any country. Inflation is a tricky economic indicator because it has both positive and negative effects on economy.

The ease of doing business index is another important economic indicator. It is a composite indicator that indicates the level of difficulty in setting up a business. If a country has a good value in this indicator, then we can tell that the rules and regulations for setting up a new business is probably relatively easy and therefore more investor friendly, making it a more attractive destination for both domestic and foreign investors.

Social Indicators

In our social indicators we want to include factors that impact the everyday lives of people. How well are people living? Do they have the necessary resources to live a good life? Can they improve and make the best of their lives with the available resources? To answer these questions, we include 23 social indicators that can be divided into 8 categories: education, health and life expectancy, unemployment, safety and stability, gender inequality, infrastructure, income, and lastly, which is not really a category but an index, the Human Development Index. Below is a table of the components of each category:

Social Indicators	
Education (25 Points)	1. Education Index (UNDP) *(100%)* 2. Mean Years Schooling Females Age 25+ (UNDP) 3. Mean Years Schooling Males Age 25+ (UNDP) 4. Expected Years Schooling Females (UNDP) 5. Expected Years Schooling Males (UNDP)
Health and Life Expectancy (35 Points)	6. Life Expectancy (UNDP) (60%) 7. Total Expenditure on Health (percent of GDP) (UNDP) (15%) 8. Maternal Mortality Ratio Per 100000 Live Births (WB) (10%) 9. Mortality Rate Under 5 Years Old Per 1000 Live Births (WB) (15%)
Unemployment (-20 Points)	10. Unemployment Rate (UNDP) (100%) 11. Unemployment Rate Females (UNDP) 12. Unemployment Rate Males (UNDP)
Safety and Stability (-20 Points)	13. Homicide Rate Per 100000 People (UNDP) (65%) 14. Refugee Population By Country or Territory of Origin (WB) (35%)
Gender Inequality (-10 Points)	15. Gender Inequality Index (UNDP) (100%)
Infrastructure (25 Points)	16. Percent of Population Urban (UNDP) (10%) 17. Percent of Population With Access To Improved Water Source (WB) (25%) 18. Percent of Population With Access to Improved Sanitation (WB) (25%) 19. Percent of Population With Access to Electricity (WB) (25%) 20. Mobile Cellular Subscriptions Per 100 People (WB) (10%) 21. Internet Users Per 100 People (WB) (10%)
Income (15 Points)	22. Income Index (UNDP) (100%)
Human Development Index (5 Points)	23. Human Development Index (UNDP) (100%)

Table 2: Social indicators used to derive the Social Development Index. WB indicates the data is from the World Bank. UNDP indicates the data is from the United Nations Development Programme. The percentages at the end of each indicator indicates what percent of the category points that indicator make up.

Education is important to all people. People need basic knowledge for their everyday lives. Beyond a basic level of education necessary to function in every day life, education empowers people to improve their quality of life. With education, people are able to find better jobs that pay more and improve their economic situation. The education index provides a means of measuring how well a country performs in providing education to its people. We also included in the education category the mean years of schooling and expected years of schooling for both males and females. These indicators are used to evaluate the equality in education between sexes. The more equal the education system, the better the system is for all people, and the better the country is doing socially.

Health and living a long life is desired universally. People will live a long life if they have access to the health care they need. To compute a country's performance in this category, we considered the life expectancy of each country, the total expenditure on health as a percentage of GDP, the maternal mortality ratio, and the mortality rate of children who are 5 years old and under. The total expenditure on health allows us to see roughly how much a country is contributing to its health care. The higher the percentage of their GDP they spend on health, the more importance the country place in health care. The last two indicators we chose deals with mortality rates. These show us to some extent whether the medical facilities and health care are sufficient. If a country do not even have what it takes to take care of their newborns, the young, and the vulnerable, they are not doing well in terms of health care. This has a great and lasting impact on the lives of people. The country cannot provide the necessary services for a healthy life for its people.

Our third category of social indicators is unemployment. While education plays a huge role in providing the necessary skills people need in order to lead a good life, if people do not have jobs, then education by itself is not as useful as it should be. People may be educated, but without jobs, they will not be able to earn the income necessary to feed themselves and their family. They might not be able to afford other common necessities like clothing, housing, health care, etc. We not only consider the unemployment rate, but also the unemployment rate for each sex. This may hint at inequalities that arise in employment. Particularly when females may have a higher unemployment rate because of a society's unequal treatment of females.

Fourth, safety and stability of a country determines much of the social development of a country. The homicide rate is chosen as a representative indicator of crime. When the homicide rate is high, people lives are endangered. People need to live safely in order to have good lives. Social stability of a country is the other important factor in this social category. When countries are unstable, residents tend to flee as refugees to other countries where they can seek a better life. We have used the refugee population by country of origin to measure this.

As we have previously hinted upon in previous social categories, gender inequality plays a critical role in a society's social development. Although not always true, the more

unequal the roles of males and females are in a country, the more difficult it is for the whole country as a whole to lead healthy lives. When men dominates a society, women tend to suffer. A country's level of development should be measured in light of gender equality.

Besides education, health, employment, and safety, there are other necessities people need to survive. We have chosen indicator to reflect these needs. Basic human needs include clean water, sanitation, and electricity. On top of that, communication and access to information is also very important in people's lives. Therefore we have included indicators for the number of people that have internet and mobile telephone access. To a slightly less extent, the percentage of the population that is urban also affects social development. Advanced countries tend to be very urban as urban environments often provide all necessities that people need.

Income is inseparable from how good a life people may have. The income index will give us some insight into how people are doing economically at a social level since the income index deals directly with how much people have and their purchasing power.

The last indicator we included is the Human Development Index. As an internationally recognized measurement of human development, we believe there is merit to include this index in helping determine development level.

With all the data we chose to use the available data within the last ten years. For each indicator, we took the average of the values over the last decade to obtain the value for that indicator. We believe using the ten year average will eliminate unusual changes during specific years. We want to eliminate these sudden spikes to obtain a more correct picture. The second reason we chose to use an average is because data is not available for each year. This is especially problematic when some data is not available for this year while other data is available. With a ten year average, we overcame these issues. We iterate again that we cannot measure exactly how each country is performing. Thus, an average is sufficient to tell us how a country is *roughly* doing.

Computing the Indices

When computing the economic index, we assign and take away points for each economic category. Most categories are composed from multiple indicators that make up a percentage of the category's points. The point assignments are shown in Table 1.

For all the economic indicators we allocated the points in the following way. In general, we used linear regression to normalize the values across the minimum and maximum of each indicator value for all countries. We observed that the values were too skewed for the following indicators: total GNI, GNI per capita, GDP per capita, total reserves, and industry value added. We decided to follow a different approach in these cases - we also included the average in our normalization. For inflation, economists have a variety of views on the impact of inflation on the economy, with the views ranging from positive to negative [13]. Most economists favor a low and steady rate of inflation, so we chose the optimal value of inflation as 2 and countries that have the value of 0 and 3 were the base of the regression. Countries who inflation values were beyond the base points received between -12.5 and 10 points depending on the regression.

Similar to the economic index, when computing the social index, we assign and take away points for each social category. Most categories are made up of multiple indicators. The point assignments are shown in Table 2.

For these social indicators, to derive how many points a country gets, we would normalize its social indicator value based on the highest social indicator value of all countries or if the social indicator is a percentage of population, we would use the percentage directly to extract the number of points that country gets for that indicator. For some categories where indicator data is available separately for male and females, we calculate an indicator's difference and normalize based on the maximum difference from all countries. The higher the difference, the higher the inequality for that indicator, and the more points we take away for that category.

Finally, we want to acknowledge that there is no single correct or universal method to measure a country's level of development as many factors differ from country to country. A factor that seems to have negative impact in one country may actually have positive impact in another country. In actually, these factors should be considered case by case country wise. Every country faces its own challenges, opportunities, and obstacles. What our indices tries to achieve is an approximate estimate of a country development based on the data that is available and our choice of indicators that make up our indices. By no means are we asserting with our indices are absolute.

IV. DESIGN

In this section we will describe the data flow of our study. We have different programs written for the economic and social data as the data formats and the way we create the indices are different. The following diagram shows our data flow for our economic index:

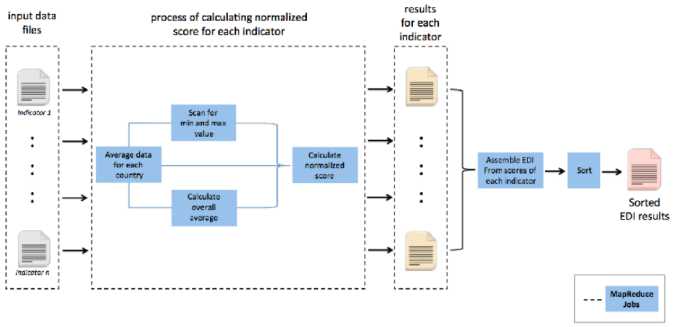

Figure 1: Data flow for economic indicators in computing the Economic Development Index.

In computing the economic index, first we parsed each input file, each of which contains an economic indicator, to extract the indicators in the format we want. For each indicator, we computed the ten year average of each indicator for each country. Then, several MapReduce programs are run to find

the max, min, and overall average for each indicator. These values are used to normalize the data. The normalized data is used to obtain the point assignments for each indicator. With all the indicators normalized, we combine them to create the Economic Development Index (EDI) using the point scheme previously mentioned. We sort each country based on their EDI and a ranking is produced.

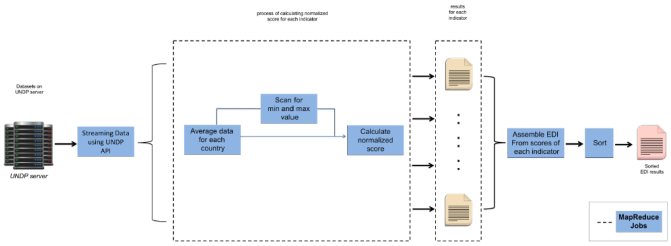

Figure 2: Data flow for social indicators in computing the Social Development Index.

Another set of MapReduce programs implementing similar methods is created to compute the social index. We used the Human Development Data API to stream some of the human development indicator data. The ten year average for all social indicators for each country is computed. For each social indicator, the average over all country's values is computed and is used to normalize the indicators. We combine the indicators to create the Social Development Index (SDI) using the point scheme previously mentioned. Each country is sorted based on their SDI.

Finally, with both the Economic Development Index and the Social Development Index, we create an index for the overall development of each country. First, we normalize both indices based on the highest value in each index. We assign each of the normalized indices 50 points. We sum these points up to form the overall development index for each country. We call this the Best Country Index. The next section describes our results.

V. RESULTS

Below are the color coded world maps for the Economic, Social, and Best World indices:

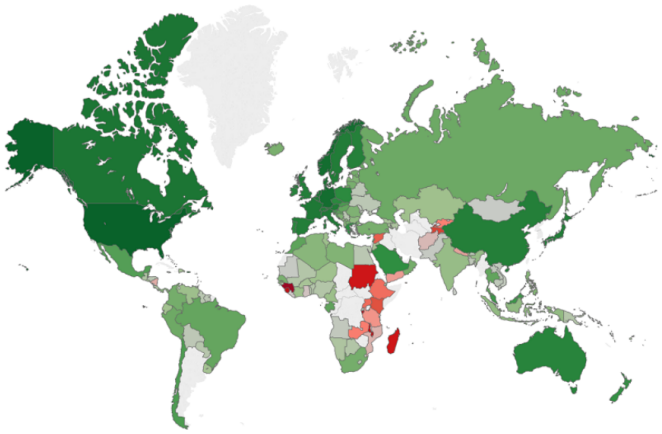

Figure 3: Color coded world map of the Economic Development Index. Countries in darker green indicates countries of high economic development. Countries in darker red indicates countries of lower economic development.

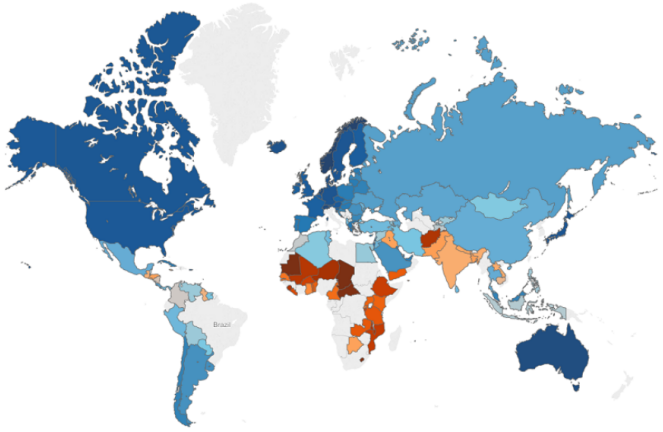

Figure 4: Color coded world map of the Social Development Index. Countries in darker blue indicates countries of high social development. Countries in darker red indicates countries of lower social development.

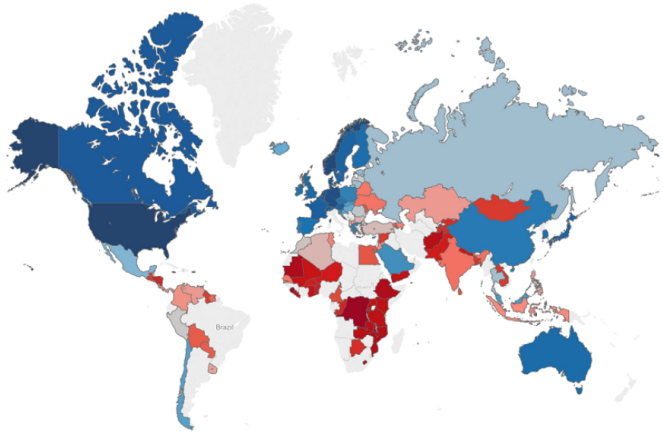

Figure 5: Color coded world map of the Best Country Index. Countries in darker blue indicates countries of higher overall development. Countries in darker red indicates countries of lower overall development.

The results shows that the United States, Canada, China, Australia, along with many European countries with high levels of economic development. The United States, Canada, Australia, and similar European countries also have high levels of social development. Many African countries have low levels of development in both our social and economic index. When these are combined, the Best Country Index shows these same countries with the highest level of overall development. Our findings seem to reinforce a well known development pattern observed called the North South Divide. The countries in the north appears to be doing better in both economic and social indicators than the countries in the south. These maps seem to show that countries of high economic development also have high levels of social development. So the question arises – do

countries of high economic development also have high social development?

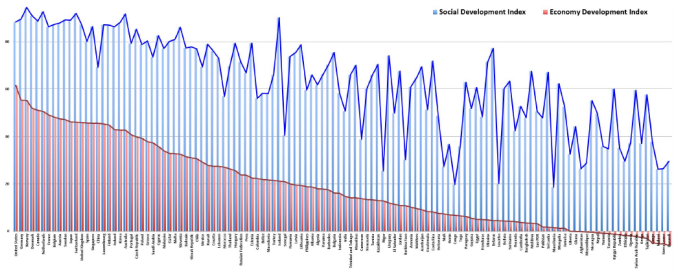

Figure 6: Social Indicator Index with respect to Economic Development Index.

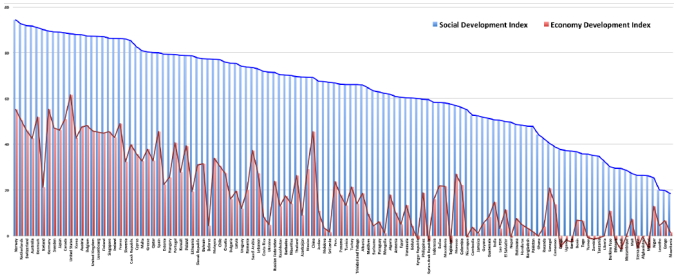

Figure 7: Economic Indicator Index with respect to Social Indicator Index.

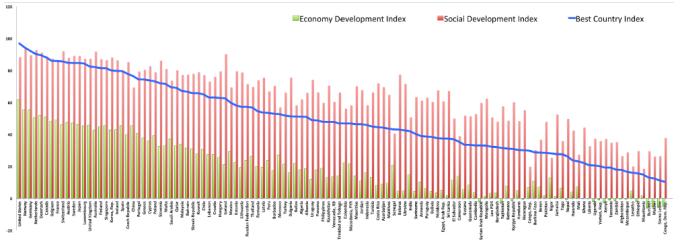

Figure 8: Ranking of each country by the Best Country Index.

The answer is usually, but not always. In figures 6 and 7, the countries are ranked by their EDI and SDI respectively and the other index is shown beside it. What we notice in both figures when looking at the figures from left to right, where the sorted index in their respective figure is decreasing, is that the other index also tends to decrease along side it. This is true in both figures. What this tells us is that, there must be some correlation between a country's level of economic development and social development. This correlation might be not a very strong connection, but in Ranis, Stewart, and Ramirez's words, there is a "causal connection" between the two [7]. Generally, the higher a country's level of economic development, the higher we can expect that country's level of social development to be, or vice versa.

However, notice that there are numerous spikes in both figures. These spikes are the countries that are either out performing or under performing relative to its rank based on index being sorted. For example, in Figure 6, towards the left side of the graph, there is a significant dip in the Social Development Index line. The dip corresponds to China. It's level economic development is high thus it ranks towards the left side of the graph. However, relative to its level of economic development, its level of social development is significantly lower than where we would expect it to be. Thus, a dip is shown indicating its social development is lower than its neighbors with similar levels of economic development. Similarly, for Iceland, even though its level of economic development isn't impressive, its level of social development is outstanding. In Figure 7, it has a very steep dip. It's social development ranks amongst the countries with the highest levels of economic development. These two countries and many others illustrate that looking at one aspect alone, do not tell the whole story on the overall development level of a country. Countries may do very well in economic development, but completely ignore social development, resulting in mediocre development overall. Our Best Country Index was developed for this reason.

That brings us to our next revelation. When looking at the Best Country Index graph, we observe that certain countries like Belarus, Ukraine, and Syria have a huge variance between their economic and social indicators, indicating that there might be something wrong with their overall economic health. This could be an alert requiring attention.

Lastly, we're reminded that even traditional methods of measuring a country's development based on economic indicators like GDP may not give us as accurate an indication as we might believe of a country's economic situation. With the Economic Development Index ranking we created, we noticed that many countries that ranks near the top of the list in some GDP rankings do not rank as high in our rankings. Qatar, Kuwait, Brunei all rank amongst the top 6 countries in GDP per capita, but in our ranking, they all ranked lower than 30. By carefully including more diverse economic indicators in our index, we have a more accurate indication of each country's economic development.

VI. Future Work

Our study only scratches the surface when trying to come up with an accurate measure for a country's level of development. While our indices included many different indicators on various facets of people's lives and a country's economic situation, much important information is left out – partially intentional due to our choice and partially because we just do not have the information. When more information covering other important aspects are available, they may be included in computing indices similar to ours.

Further more because the importance and the weight we assigned to each indicator was based on our perceived importance and impact they have on people's lives, the assignment of these weights can be more finely tuned. While we agree that there is no single correct method, a more in-depth study may derive a more accurate assignment.

VII. Conclusion

With our indices, we have a comprehensive overview of how each country is doing with respect to both economic and social development, giving us a more accurate picture of the effectiveness of the development policies being adopted by different governments. Every country can quickly access its strengths, weaknesses, and the areas it needs to focus on. We can easily compare different countries on different indicators, finding out which countries are outperforming other countries on specific indicators. Then highly developed countries can act as role models for other countries, where those countries can implementing similar policies to improve their level of development. Appropriate social and institutional changes, and in particular, the presence of the will to develop, are essential ingredients in economic development. The opposite is also true, careful and proper allocation of resources will lead to greater social development. We are envisioning a world that encompasses global cooperation and global coordination rather than global competition and global conflict, where countries helps other countries to grow and realize their full potential.

VIII. Related Work

1. "Getting Ahead and Falling Behind: A Sociological Elaboration of Sen's Theory of Human Development" by Robert M Marsh.

Marsh evaluates Amartya Sen's theory in human development from a sociological perspective. Sen's theory in human development looks at GDP per capita and specifically emphasizes a society's "capabilities" which refer "to the ability or opportunity people have to achieve given outcomes." These capabilities include life expectancy, schooling, income equality, political freedom, and life satisfaction. Marsh tries to find correlations in indices of human development and GDP per capita. The points of interest are the outliers that do not perform as expected. Marsh tries to explain these outliers by drawing into the geographic, social, and political situations of these countries or regions.

2. "Another Approach to Measuring Human Development: The Composite Dynamic Human Development Index" by Javier Bilbao-Ubillos.

Bilbao-Ubillos argues that measuring human development solely on the basis of economic growth is not sufficient. He further states that the Human Development Index (HDI), an internationally recognized indicator for human development, is lacking in some aspects and he proposes his own method as an alternate extension to the conventional measurement. He first outlines some of the other proposals made to supplement the HDI and their shortcomings. Bibao-Ubillos then proposes to add a "dynamic factor" to the HDI revised in 2010. He calls the resulting index the Composite Dynamic Human Development Index (CDHDI). The dynamic factor is an adjustment to the HDI based on a specific country's human development trend in the last 30 years. He says that the dynamic factor eliminates certain biases that would skew a country's HDI. Lastly, he compared results from several countries using the HDI and the CDHDI and offered explanations to the resulting differences.

3. "Economic Growth and Human Development" by Gustav Ranis, Frances Stewart, and Alejandro Ramirez.

The paper defines human development as increasing people's choices in such a way that enables them to lead long, healthier and fuller lives. The authors consider health and education indicators as the basis of human development. The study seeks to analyze human and economic development at both theoretical and empirical levels. Human development is seen as the central objective of human activity and economic growth. Two distinct causal chains are analyzed – one that runs from economic growth to human development and the other that runs from human development to economic growth. The same level of GNP can lead to very different performances on human development depending on variations of allocation of GNP amongst different sectors. The study asserts that there is plenty of evidence that suggests that as people become healthier, better educated, and more nourished, they contribute more to economic growth. The positive impact of education on economy at both macro and micro levels is evident. We would expect important causal connections to exist between economic and human development achievements, but these connections are not automatic and depend on a range of factors. Economic growth on its own will not survive until it is accompanied by improvements in human development.

4. "Human Development and Economic Sustainability" by Sudhir Anand and Amartya Sen.

The paper focuses on strategies that can be adopted to ensure sustainable human development. Although there has been significant progress in the living standards of people compared to the recent past, the fundamental inequalities in growth and development still remain a big challenge. The paper asserts that the association between the Human Development Index and economic growth is far from perfect. Some countries perform rather well on the Human Development Index despite not performing as well on the GNP. Different countries have different experiences and there is no one single strategy that works for all countries. The study calls for "Ethical Universalism," which is a demand for impartiality applied between different generations. It calls for a broad view of human development that also includes the concerns of the future generation and the environment and acknowledges that equity in the present can be achieved by redistribution. In particular, the study focuses on sustainable development, which is the harmony with the environment and that we have the responsibility to ensure future generations also have access to the same resources we have. Human development can contribute to sustainability. Models of sustainable development are preferable, which leads to equitable sharing of resources between different generations.

5. "Cross-Cultural Comparison of Nonverbal Cues in Emoticons on Twitter: Evidence from Big Data Analysis" by Jaram Park, Young Min Baek, and Meeyoung Cha.

The goal in the study is to use big data analytic approaches to test hypotheses in cross-cultural communication from a methodological perspective. The study first raised two hypotheses – mouth-oriented emoticons are favored by people with individualistic cultures and eye-oriented emoticons are

favored by collectivistic cultures. It aimed to improving existing studies on cross-cultural communication by apply data analytic technologies, which allowed the study to include data from more countries and cultures. The resulting measurement was done based on the type of emoticons, percent of mouse-oriented emoticons, percent of eye-oriented emoticons, and Geert Hofstede's national culture scores, which provided a multidimensional mode of national culture to explain cultural differences. The final result shows statistics on emoticons used among Twitter users, relationships between national culture and the use of mouth or eye-oriented emoticons, as well as relationships between national culture and emotional expression of facial cues.

6. “Measuring Human Development” by Peter Smith.

Smith summarizes two common sources used in measuring human development, one by the United Nations Development Programme (UNDP) and the other, the Human Development Index (HDI), in a critical view. The study discussed the details and differences of the two sources, as well as their limitations. People often use these two indicators to demonstrate how, in our world where extreme inequalities exist, the distributions of resources relates to the quality of life experienced by people. The study argued that both the UNDP indicator and the HDI did not show correlations between different criteria. The rankings of countries based on GDP per capita may differ greatly compared to rankings of countries based on health nutrition or education among the same countries. The study also suggested that it should be recognized that countries in different parts of the world with different cultures are likely to have different social objectives and standards. This suggests that a new method is needed to judge each country's human development, where different standards apply based on each country's own situation.

ACKNOWLEDGMENT

We thank the World Bank and the United Nations Development Programme for providing the open data on economic and human development on their websites, without which we would not have the necessary historic data for our analytic.

REFERENCES

[1] T. White. “Hadoop: The Definitive Guide.” O’Reilly Media Inc., Sebastopol, CA, May 2012.

[2] J. Dean and S. Ghemawat. “MapReduce: Simplified Data Processing On Large Clusters.” In proceedings of 6th Symposium on Operating Systems Design and Implemenation, 2004.

[3] S. Ghemawat, H. Gobioff, S. T. Leung. “The Google File System.” In Proceedings of the nineteenth ACM Symposium on Operating Systems Principles – SOSP ‘03, 2003.

[4] Bilbaos-Ubillos, Javier. “Another Approach to Measuring Human Development: The Composite Dynamic Human Development Index.” *Springer* 11.2 (2013): 473-484.

[5] Marsh, Robert. “Getting Ahead and Falling Behind: A Sociological Elaboration of Sen's Theory of Human Development.” *Social Science Quarterly* 95.4 (2014): 1001-1021.

[6] Ranis, Gustav, Frances Stewart, and Alejandro Ramirez. “Economic Growth and Human Development.” *World Development* 28.2 (2000): 197-219.

[7] Anand, Sudhir, and Amartya Sen. “Human Development and Economic Sustainability.” *World Development* 28.12 (2000): 2029-2049.

[8] Park, Jarm, Young Min Baek, and Meeyoung Cha. “Cross-Cultural Comparison of Nonverbal Cues in Emoticons on Twitter: Evidence from Big Data Analysis.” *Journal of Communication* 64.2 (2014): 333-354.

[9] Smith, Peter. “Measuring Human Development.” *Asian Economic Journal* 7.1 (1993): 89-106.

[10] Foa, Robert, Jeffery C. Tanner. “Methodology of the Indices of Social Development.” *Indices of Social Development*. 1 Aug. 2012.

[11] Investopedia Staff. “What is GDP and Why Is It So Important To Economists and Investors?” *Investopedia*.

[12] “The Role of GDP In Measuring Economic Performance Broadly.” U.S. Department of Commerce, Bureau of Economic Analysis. 23 May. 2011.

[13] Svensson, Lars E.O. “Escaping From a Liquidity Trap and Deflation: The Foolproof Way and Others.” *Journal of Economic Perspectives* 17.4 (2003): 145-166.

[14] Haq, Khadija. “Human Development Index and Its Relevance for Developing Countries.” Foreign Service Academy. 1 Feb. 2007.

Economic Development Index		
Rank	**Countries**	**Economic Development Index**
1	United States	61.5821762766
2	Germany	55.2625108338
3	Norway	55.2046783984
4	Denmark	51.8726141478
5	Canada	50.965782874
6	Netherlands	50.5511908468
7	France	49.0402202943
8	Italy	48.5314392431
9	Belgium	48.1388406186
10	Austria	47.4738402047
11	Sweden	47.0812488585
12	Japan	46.1596517387
13	Switzerland	45.9781849593
14	United Kingdom	45.8230503001
15	Spain	45.5935495066
16	Singapore	45.5296693319
17	China	45.5134101404
18	Luxembourg	45.2559852896
19	Finland	44.7786396422
20	Ireland	42.9118116941
21	Korea, Rep.	42.6612340751
22	Australia	42.5936684082
23	Portugal	40.6820424019
24	Hong Kong SAR, China	40.3729140637
25	Czech Republic	39.7995294336
26	Poland	39.1593769528
27	Greece	37.7761399032
28	Saudi Arabia	37.2639679886
29	New Zealand	35.9791885206
30	Cyprus	35.7538802158
31	Malaysia	33.9317525914
32	Bahamas, The	33.3617349501
33	Qatar	32.797127151
34	Malta	32.7125047079
35	Slovenia	32.4181781091
36	Bahrain	31.4558175833
37	Slovak Republic	30.9422401508
38	Chile	30.5363353644
39	Antigua and Barbuda	29.794190541
40	Mexico	29.1674863287
41	Kuwait	27.8062602588
42	Croatia	27.3924118846
43	Lebanon	27.3417025224
44	Morocco	26.9901521681
45	Brunei Darussalam	26.7595940907
46	Gabon	26.624526008
47	Thailand	26.2806740158
48	Brazil	25.6778847071
49	Hungary	25.5263841464
50	Russian Federation	23.7712540594
51	Peru	23.6857075339
52	Dominica	22.7514789121
53	Estonia	22.4495940591
54	Oman	22.2430927516

55	Colombia	22.1741060668
56	South Africa	22.1413728568
57	Belize	21.8264496979
58	Macedonia, FYR	21.6196269021
59	Lithuania	21.4600142413
60	Turkey	21.3220067034
61	Iceland	21.1586157891
62	Senegal	20.8206796436
63	Vanuatu	20.7194054648
64	Bosnia and Herzegovina	20.2862470792
65	Romania	19.9767176125
66	Latvia	19.4597492686
67	Libya	19.2909509204
68	St. Kitts and Nevis	18.9219832612
69	Philippines	18.7543749302
70	Albania	18.5484292688
71	Algeria	17.8407866325
72	Panama	17.7479307323
73	St. Lucia	17.7447567439
74	Barbados	17.4274445105
75	Kosovo	17.3482246495
76	Bulgaria	16.0396786797
77	Indonesia	15.9548850554
78	Montenegro	15.6085681482
79	Cabo Verde	15.2864020842
80	India	14.6979185167
81	Trinidad and Tobago	14.0837327763
82	Mauritius	14.0788609063
83	Grenada	13.9909957057
84	Cameroon	13.7168589284
85	Venezuela, RB	13.3523192725
86	Tunisia	13.2109279839
87	Cote d'Ivoire	13.0244431222
88	Kazakhstan	12.8946764273
89	St. Vincent and the Grenadines	12.8525266108
90	Niger	12.7849496308
91	Ecuador	12.1880428768
92	Uruguay	11.8941013709
93	El Salvador	11.3239582602
94	Seychelles	11.0134190295
95	Fiji	10.8746561573
96	Dominican Republic	10.8685174419
97	Jordan	10.8244314192
98	Burkina Faso	10.7569208872
99	Georgia	10.1642296264
100	Armenia	10.1607442507
101	Maldives	9.4726419671
102	Azerbaijan	9.0153418295
103	Namibia	8.7834140398
104	Tonga	8.721783764
105	Guatemala	8.2639212268
106	Timor-Leste	8.1721623301
107	Costa Rica	8.1395288757
108	Guinea-Bissau	7.8931734214
109	Djibouti	7.6665515406
110	Botswana	7.4607069117
111	Nigeria	7.2066890826

112	Mali	7.2032573268
113	Benin	6.8778496487
114	Papua New Guinea	6.7196042459
115	Congo, Rep.	6.6355948716
116	Comoros	6.4971363952
117	Togo	6.4643693317
118	Paraguay	6.1227013961
119	Guyana	5.4270962628
120	Serbia	5.2012285184
121	Egypt, Arab Rep.	5.0343634173
122	Honduras	4.8261858758
123	Ukraine	4.7574173068
124	Belarus	4.3671603261
125	Lesotho	4.3478703895
126	Bolivia	4.2370464157
127	Suriname	4.2000164759
128	Rwanda	3.9650017544
129	Cambodia	3.7153241489
130	Swaziland	3.6818431911
131	Bhutan	3.6162451185
132	Bangladesh	3.3745267412
133	Moldova	3.3222778959
134	Lao PDR	3.1457303572
135	Vietnam	2.9782462899
136	Angola	2.7595862877
137	Pakistan	1.7638410751
138	Sri Lanka	1.6395012162
139	Solomon Islands	1.560986584
140	Mauritania	1.4987207032
141	Mongolia	1.1543577247
142	Jamaica	1.119533971
143	Liberia	-0.056372215
144	Ghana	-0.1529523545
145	Afghanistan	-0.3334759407
146	Mozambique	-0.4327818854
147	Nicaragua	-0.57238031
148	Nepal	-0.7208614081
149	Yemen, Rep.	-0.8761408609
150	Tanzania	-1.0327673703
151	Kyrgyz Republic	-1.3859680574
152	Zambia	-1.4940764707
153	Ethiopia	-1.9045636705
154	Uganda	-1.9992634618
155	Syrian Arab Republic	-2.3151509483
156	Kenya	-2.6748861151
157	Tajikistan	-3.038696705
158	Sao Tome and Principe	-3.2667818291
159	Madagascar	-4.2543654604
160	Sudan	-4.2928986633
161	Congo, Dem. Rep.	-4.985201169
162	Malawi	-5.3093828839
163	Sierra Leone	-5.4689187059
164	Burundi	-5.9757251126
165	Guinea	-6.7900478977

Social Development Index		
Rank	**Countries**	**Social Development Index**
1	Norway	94.3758595295
2	Netherlands	92.5801088895
3	Switzerland	91.8509605228
4	Australia	91.6723509312
5	Denmark	90.9768580488
6	Iceland	90.1540572726
7	Germany	89.5141981342
8	Sweden	89.0909164624
9	Japan	89.0320987262
10	Canada	88.6699647565
11	United States	88.2866679332
12	Korea, Rep.	88.0303098953
13	Austria	87.882405467
14	Belgium	87.272778945
15	United Kingdom	87.2344551345
16	Luxembourg	87.1717496453
17	Finland	87.0233131214
18	Singapore	86.3756344177
19	Ireland	86.2825695378
20	Israel	86.2772317647
21	France	86.2643723295
22	Slovenia	86.0692461058
23	Czech Republic	85.1852665173
24	Cyprus	82.5791458369
25	Malta	80.8935174682
26	Greece	80.3183764434
27	Qatar	80.0706946347
28	Spain	80.0313137541
29	Cuba	79.5143633445
30	Estonia	79.3982769296
31	Hungary	79.3616052898
32	Portugal	79.2713956888
33	United Arab Emirates	78.9373517065
34	Kuwait	78.857340675
35	Poland	78.7317776695
36	Lithuania	78.6689269494
37	Slovak Republic	77.8158714646
38	Bahrain	77.3451154278
39	Belarus	77.2395214817
40	Malaysia	77.0826323399
41	Chile	76.9583416402
42	Croatia	75.9480678339
43	Bulgaria	75.3945627868
44	Latvia	75.346174156
45	Uruguay	74.0732327125
46	Argentina	73.8135852529
47	Romania	73.7488008967
48	Saudi Arabia	73.5283303324
49	Lebanon	72.9029261536
50	Costa Rica	71.8274537242
51	Ukraine	71.5089340205
52	Russian Federation	71.3564010999
53	Kazakhstan	70.3844742522
54	Barbados	70.2083632806

55	Mauritius	69.9930885636
56	Thailand	69.4946115328
57	Azerbaijan	69.3885004421
58	Mexico	69.2963031183
59	China	69.2229229719
60	Jordan	67.57838721
61	Moldova	67.4521919858
62	Sri Lanka	67.0009946878
63	Peru	66.7738092962
64	Panama	66.1850521137
65	Tunisia	66.0627809505
66	Turkey	66.0531935814
67	Trinidad and Tobago	66.042023486
68	Albania	65.9373559834
69	Maldives	64.648558887
70	Iran, Islamic Rep.	63.6073469242
71	Suriname	63.2876860019
72	Paraguay	62.8656934454
73	Mongolia	62.2458637918
74	Algeria	61.8091576433
75	Armenia	60.9191944932
76	Egypt, Arab Rep.	60.545431256
77	Venezuela, RB	60.2495967599
78	Bolivia	60.1856003424
79	Kyrgyz Republic	59.9770622091
80	Philippines	59.6283423668
81	Syrian Arab Republic	59.5268004004
82	Indonesia	58.2443436267
83	Belize	58.1564203571
84	Macedonia, FYR	58.0815484081
85	Tajikistan	57.5346469697
86	Morocco	56.8897980083
87	Colombia	56.0533196771
88	Nicaragua	55.1122799879
89	Cambodia	52.6891386317
90	Jamaica	52.4177081038
91	Guyana	51.7273379021
92	Guatemala	51.2422823504
93	India	50.6420691498
94	Lao PDR	50.5323791394
95	El Salvador	49.862086618
96	Nepal	49.6036527176
97	Iraq	48.6791712599
98	Botswana	48.5643342228
99	Honduras	48.2770991264
100	Bangladesh	47.8782590713
101	Pakistan	47.8096240747
102	Ghana	44.241167649
103	Rwanda	42.3648566261
104	Senegal	40.4303072262
105	Cameroon	38.871355974
106	Congo, Rep.	37.6865092278
107	Uganda	37.1937619192
108	Kenya	37.0145629537
109	Benin	36.6300497323
110	Togo	35.7782651578
111	Yemen, Rep.	35.7471601236

112	Zambia	35.0631785243
113	Tanzania	34.7260042546
114	Liberia	32.4990825071
115	Burkina Faso	30.1863800012
116	Ethiopia	29.512517878
117	Burundi	29.4332877719
118	Mozambique	28.6439122358
119	Mali	27.2399519835
120	Sierra Leone	26.3565211579
121	Afghanistan	26.3494683535
122	Malawi	26.1344797429
123	Niger	25.3891719983
124	Lesotho	19.993737098
125	Congo, Dem. Rep.	19.743121674
126	Central African Republic	19.1291122004
127	Chad	18.5233335491
128	Mauritania	18.4851034022

Best Country Index				
Rank	**Country**	**Best Country Index**	**Economic Development Index**	**Social Development Index**
1	United States	96.7739676086	61.5821762766	88.2866679332
2	Norway	94.3492622153	55.2046783984	94.3758595295
3	Germany	92.1749400674	55.2625108338	89.5141981342
4	Netherlands	90.2669667747	50.5511908468	92.5801088895
5	Denmark	89.5270708722	51.8726141478	90.9768580488
6	Canada	88.0455527228	50.965782874	88.6699647565
7	Belgium	86.0131273163	48.1388406186	87.272778945
8	France	85.8502710706	49.0402202943	86.2643723295
9	Switzerland	85.6052308795	45.9781849593	91.8509605228
10	Austria	84.7702176265	47.4738402047	87.882405467
11	Sweden	84.6682159724	47.0812488585	89.0909164624
12	Japan	84.5984459987	46.1596517387	89.0320987262
13	Luxembourg	84.2677186226	45.2559852896	87.1717496453
14	United Kingdom	82.4388520304	45.8230503001	87.2344551345
15	Australia	82.0224402741	42.5936684082	91.6723509312
16	Finland	81.4092513005	44.7786396422	87.0233131214
17	Singapore	81.3755029506	45.5296693319	86.3756344177
18	Korea, Rep.	79.9185700173	42.6612340751	88.0303098953
19	Ireland	79.6802105425	42.9118116941	86.2825695378
20	Spain	79.5427500999	45.5935495066	80.0313137541
21	Czech Republic	77.7896302605	39.7995294336	85.1852665173
22	China	76.503749673	45.5134101404	69.2229229719
23	Portugal	74.4270463703	40.6820424019	79.2713956888
24	Greece	74.2511399195	37.7761399032	80.3183764434
25	Cyprus	73.671899414	35.7538802158	82.5791458369
26	Poland	73.1303517498	39.1593769528	78.7317776695
27	Slovenia	71.9120819916	32.4181781091	86.0692461058
28	Malta	71.4618230173	32.7125047079	80.8935174682
29	Saudi Arabia	69.4325326546	37.2639679886	73.5283303324
30	Qatar	69.0203181943	32.797127151	80.0706946347
31	Malaysia	67.1021714182	33.9317525914	77.0826323399
32	Bahrain	66.6547587971	31.4558175833	77.3451154278
33	Slovak Republic	65.6582939867	30.9422401508	77.8158714646
34	Kuwait	65.6278461367	27.8062602588	78.857340675
35	Chile	65.0342638644	30.5363353644	76.9583416402
36	Lebanon	63.0231770599	27.3417025224	72.9029261536
37	Croatia	62.9516572519	27.3924118846	75.9480678339
38	Hungary	62.6530313088	25.5263841464	79.3616052898
39	Iceland	62.4528795947	21.1586157891	90.1540572726
40	Mexico	59.8188557665	29.1674863287	69.2963031183
41	Estonia	58.1226062769	22.4495940591	79.3982769296
42	Lithuania	57.2171922758	21.4600142413	78.6689269494
43	Russian Federation	57.1968253013	23.7712540594	71.3564010999
44	Thailand	56.7328744171	26.2806740158	69.4946115328
45	Romania	54.4756358385	19.9767176125	73.7488008967
46	Latvia	53.6056680996	19.4597492686	75.346174156
47	Peru	53.3617199934	23.6857075339	66.7738092962
48	Barbados	52.9539183862	17.4274445105	70.2083632806
49	Morocco	52.6647717089	26.9901521681	56.8897980083
50	Turkey	51.7676150506	21.3220067034	66.0531935814
51	Bulgaria	51.3271415043	16.0396786797	75.3945627868
52	Belize	51.0886709549	21.8264496979	58.1564203571
53	Algeria	51.0173034937	17.8407866325	61.8091576433
54	Albania	50.9049669553	18.5484292688	65.9373559834

55	Uruguay	48.9006726909	11.8941013709	74.0732327125
56	Panama	48.7202521438	17.7479307323	66.1850521137
57	Philippines	47.860291282	18.7543749302	59.6283423668
58	Kazakhstan	47.7554906666	12.8946764273	70.3844742522
59	Venezuela, RB	47.742657457	13.3523192725	60.2495967599
60	Trinidad and Tobago	46.8970070742	14.0837327763	66.042023486
61	Colombia	46.7744375461	22.1741060668	56.0533196771
62	Macedonia, FYR	46.7541358446	21.6196269021	58.0815484081
63	Mauritius	46.3451700582	14.0788609063	69.9930885636
64	Jordan	46.319286567	10.8244314192	67.57838721
65	Indonesia	45.8356050778	15.9548850554	58.2443436267
66	Tunisia	44.8790752818	13.2109279839	66.0627809505
67	Costa Rica	44.5285211275	8.1395288757	71.8274537242
68	Azerbaijan	44.1695518592	9.0153418295	69.3885004421
69	Maldives	43.5091270774	9.4726419671	64.648558887
70	Senegal	43.0338093355	20.8206796436	40.4303072262
71	Belarus	42.9825893348	4.3671603261	77.2395214817
72	Ukraine	42.4862538843	4.7574173068	71.5089340205
73	India	41.8953053063	14.6979185167	50.6420691498
74	Suriname	40.2816859443	4.2000164759	63.2876860019
75	Armenia	38.9596402938	10.1607442507	60.9191944932
76	Paraguay	38.5459083652	6.1227013961	62.8656934454
77	Bolivia	38.3669398081	4.2370464157	60.1856003424
78	Moldova	37.6036152247	3.3222778959	67.4521919858
79	Egypt, Arab Rep.	37.3184759423	5.0343634173	60.545431256
80	Sri Lanka	37.2647261689	1.6395012162	67.0009946878
81	El Salvador	36.9515328068	11.3239582602	49.862086618
82	Cameroon	35.3580330989	13.7168589284	38.871355974
83	Guyana	33.4358119536	5.4270962628	51.7273379021
84	Guatemala	33.3345837403	8.2639212268	51.2422823504
85	Cambodia	33.0254636575	3.7153241489	52.6891386317
86	Syrian Arab Republic	33.0082431592	-2.3151509483	59.5268004004
87	Mongolia	32.8702284561	1.1543577247	62.2458637918
88	Lao PDR	32.1768918506	3.1457303572	50.5323791394
89	Bangladesh	31.9065972457	3.3745267412	47.8782590713
90	Tajikistan	31.3871275181	-3.038696705	57.5346469697
91	Botswana	31.116540178	7.4607069117	48.5643342228
92	Kyrgyz Republic	30.8148384766	-1.3859680574	59.9770622091
93	Honduras	30.1450567699	4.8261858758	48.2770991264
94	Nicaragua	29.980687481	-0.57238031	55.1122799879
95	Congo, Rep.	29.6997713917	6.6355948716	37.6865092278
96	Burkina Faso	28.6699650338	10.7569208872	30.1863800012
97	Benin	28.4415033145	6.8778496487	36.6300497323
98	Pakistan	28.3983373203	1.7638410751	47.8096240747
99	Niger	28.0273288813	12.7849496308	25.3891719983
100	Jamaica	27.6560759096	1.119533971	52.4177081038
101	Togo	27.5100495339	6.4643693317	35.7782651578
102	Nepal	26.2774019882	-0.7208614081	49.6036527176
103	Rwanda	23.6853304016	3.9650017544	42.3648566261
104	Mali	23.0748710689	7.2032573268	27.2399519835
105	Ghana	22.1125414222	-0.1529523545	44.241167649
106	Liberia	20.720613799	-0.056372215	32.4990825071
107	Uganda	20.5657901791	-1.9992634618	37.1937619192
108	Yemen, Rep.	20.0851876202	-0.8761408609	35.7471601236
109	Kenya	19.199440341	-2.6748861151	37.0145629537
110	Tanzania	19.1494822535	-1.0327673703	34.7260042546
111	Zambia	17.9178446976	-1.4940764707	35.0631785243

112	Afghanistan	17.7565861008	-0.3334759407	26.3494683535
113	Mozambique	16.6413873916	-0.4327818854	28.6439122358
114	Lesotho	15.9555709716	4.3478703895	19.993737098
115	Ethiopia	15.6213356711	-1.9045636705	29.512517878
116	Mauritania	14.8261292913	1.4987207032	18.4851034022
117	Burundi	12.9601449965	-5.9757251126	29.4332877719
118	Malawi	12.3822238343	-5.3093828839	26.1344797429
119	Sierra Leone	11.2612815176	-5.4689187059	26.3565211579
120	Congo, Dem. Rep.	10.2391401174	-4.985201169	19.743121674