Economic factors affecting economic growth: How does corruption affect economic growth?

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Abstract

It is a common perception that the economic growth of a country is greatly influenced by the social and economic factors of the country. Factors like corruption, political stability, employment participation rate are related to per capital GDP. Through this research paper I plan to demonstrate the relationship that these indicators have on economic growth of a country and will try to probe further into any disparity that might exist between developed countries and rest of the world. Using a combination of simple regression analysis as well as multiple regression analysis this paper looks at the impact of different social and economic factors on economic growth. It is to be noted that there is a causal relationship between a corruption and the other indicators discussed in this paper. The research approach used in this paper includes gathering the most recent available data from publicly available data sources for each of the economic indicators, followed by a simple regression model for each variable pair. An attempt has been made to combine all the economic indicators discussed in this paper and build a multivariate regression to look at the inter-relationship.

Introduction

Every country in this world is striving to get better and follow the lead of developed economies. However, economic growth is very dependent on a lot of social and economic factors. One such factor being the level of corruption in the country. It is a common perception that the relationship between economic development and corruption is inverse, corruption is believed to have a negative effect on economic growth (Hough, 2017, pg.90). The relationship between economic development and corruption is relevant everywhere, since corruption is present in all countries in some form, at varying levels. One would think corruption is more of a factor in developing countries than in developed countries, but that may not be necessarily true.

Corruption is present in poor and wealthy countries as well. For instance, I come from Serbia which is technically a second world country but is ranked 87th in terms of level of corruption, but China which is economically more developed than Serbia and has the world fastest growing economy is ranked 87th too, with a corruption perception index of 39 (on the scale from 0-100 CPI, where 100 is the least corrupt) based on 2018 rankings (Corruption Perceptions Index, 2019). Another great example is Denmark which is the least corrupt country with a corruption perception index of 88 and fares significantly better than the United States of America with a corruption score of 71(Corruption Perceptions Index, 2019). The previous example shows that corruption occurs everywhere including the US which is the most developed country in the world. To put things into perspective the GDP per capita in 2018 for the US was 62,794.59 USD and for Denmark it was 61,350.35 USD (Worldbank, 2018), which is comparable, but the US has a significantly lower corruption score than Denmark.

In fact, there is argument to be made that corruption may help or hurt an economy (Méon and Sekkat, 2005), this is the reason I picked up this topic for my research to find evidence of the

impact that corruption has on economy. From an econometrics perspective economic growth and its relationship with characteristics of a country such as corruption, employment rate and political stability have an impact on each other. My research looks at building a model to explain the correlation between the country's per capita gross domestic product (GDP) as a dependent variable and other independent variables such as corruption in the country, labor productivity, employee participation and political stability. By using simple regression models to find the relation between individual variables followed by multiple regression analysis, and I have tried to find the relationships that exist.

Academic research

The country's economic growth depends on many factors, and it is beyond the scope of this research to look at all such factors. Instead I have focused on few key factors that have I thought has a significant impact on the overall growth. The factors that I have considered in my research are corruption, employee participation and political stability as these factors are known to have an effect on the overall economy. The classical relationship between economic development and corruption is non debatable, because corruption has a negative effect on everything that can possibly have a positive impact on development. (Hough, 2017, pg.92). People in power most likely would be the ones who would debate about this correlation; therefore, many people say that less corruption would lead to better policy. However, this is not the case either, if the country is more politically stable then corruption would probably decrease. The effect of corruption on economic growth has been researched multiple times, for instance D'Agostino et al (2016) published a research of negative effects of government spending and corruption on economic growth and concluded there is negative correlation between these

variables. My research also aims to find evidence of negative effects of corruption on economic growth. It is to be noted that corruption cannot be blamed on everything. According to Hough, who researched if corruption negatively affects "quality of life" variables, there was no evidence that higher corruption levels led to lower quality of life specifically impacting factors like infant mortality (2017, pg,93). This does not mean that corruption has a positive effect either. Even if we put aside all the data there is a clear evidence that corruption has a negative effect on growth. (Hough, 2017, pg.94). My paper does not dig deep into such causal relationships or the nature of those relationships, instead the scope is limited to relationships between the indicators from an econometrics perspective.

The other factors that I have considered for my research are labor productivity and employee participation. These two factors have a positive relationship with growth. If the employee participation is higher the labor productivity is also bigger, increase in productivity would lead to the employers to produce more output. More labor productivity would increase the supply of a commodity in a commodity market, labor (Pattersons, 2012, pg.190) This leads to an increase in employment and employment has a positive effect on growth. As Pattersons covered in his study "observed qualities of labor can influence labor productivity and thereby economic growth" (2012, pg.192). If labor productivity increases, it would raise the country's GDP. Labor productivity is usually based on the company's economics. Suna Korkmaz and Oya Korkmaz did an experiment on a few European countries (Belgium, Germany, Spain, France, the UK, etc) and tested the relationship between labor productivity and economic growth among those countries they selected. The results proved that there is a strong equilibrium relationship between labor productivity and economic growth (Suna&Oya Korkmaz, 2017, pg. 71). Labor productivity is probably more in developed countries than in developing countries, however studies show that

there is a positive relationship between labor productivity and GDP. Economists usually say that labor productivity is "the amount produced per worker, or GDP per person employed" (Coyle, 2014, pg.131). The effect of higher employment participation and higher employment rate on economic output is not debated, a country is said to be on growth track if the employment growth exceeds the growth of the total labor force. (Ocampo et al, 2009, pg.6). This may not be an issue in developed countries, but in developing countries more likely employment rate does lag behind the total labor force.

Political stability is also something that could impact economic growth, in my research I used it as one of the independent variables. An unstable political system could cause negative effects on the economy. There is a school of thought that says political stability depends on the type of a government. However, this research is not focusing on the government type, since political stability is different in every country, but its overall effect on the economy. Political stability tends to be lower in countries where corruption is more, since there is a link between corruption and political instability. (Nur-tegin & Czap, 2012, pg.53). Instability occurs when a government does not have enough power to prevent corruption. Political stability has a positive effect on economic growth. Alesina and his peers' research found that political instability reduces growth or investment "Political instability affects growth, because it increases policy uncertainty which has negative effects on productive economic decisions such as investment and saving." (1996, pg.190). Their study supports my assumption that if the country is politically stable it could increase economic growth. The interaction between political instability and economic growth is important, because if there is unstable political government it increases the chance of a government collapse. For instance, if there is increase in political conflict, unrelated to the economy, investment and growth could fall or the opposite example when the issue is coming

from trade, but the government will be the one to blame for poor economic outcomes as well. (Nur-tegin & Czap, 2012, pg.191). Overall, political stability plays a huge role in economic development. For a stable government a well-developed economy is needed, but a well-developed economy cannot exist without political stability.

These are some of the factors that are impacting the country's GDP. In some way they are all related and depend on each other. Political stability depends on corruption, employment participation depends somewhat on political stability, but all three of them have an effect on economic growth. Theoretically corruption is the most impactful, since it has only negative effects on the GDP growth, but the other components are needed to measure and explain the economic growth.

Data analysis

As explained in the introduction the purpose of my research was to look for evidence of any relationship between the factors mentioned above. I did this by using Microsoft Excel and running simple regression followed by multiple regression analysis with different economic parameters. The impact in economic growth is explained by GDP per capita 2018 for all 169 countries from all over the world as a dependent variable(y). The change in economic growth is explained by four independent(x) variables, these variables are GDP per capita from 2017, Corruption Perception Ondex(CPI), employment participation and political stability index. GDP per capita measures the country's economic output based on its number of people, corruption is the fraud conduct by people in power and authority, the employment participation tells us how many of the eligible labor force is really looking to contribute towards the GDP and political stability index measures the presence of a stable government environment. The data for GDP

was gained from the World Bank from 2017 and 2018, corruption perception index for 2018 was

collected from the Transparency initiative, the employment participation data was collected from

the World Bank from 2017 and 2018. Political stability data for 2018 was collected from The

Global Economy. In addition, to provide more context to my research I created a dummy

variable for developed and developing countries. The dummy variable has the value of 0 or 1 to

indicate the presence or the absence of some categorical effect that could impact the regression.

In my research, if the country is on the developed list, I assigned the variable a value of 1 and for

all other countries I set the value to 0. Here is a summary of the descriptive statistics of the data I

collected.

| Variable	Mean	Std.Dev	Median	Minimum	Maximum
GDP2017	13866.49	19158.29	5417.64	293	107361.31
GDP2018	14795.83	20511.646	6065.67	271.75	116639.89
CPI	43.64	18.96	38	10	88
Political stability	-0.13	0.94	-0.05	-3	1.54
Employment rate	62.8	10.25	62.36	38.04	86.71

Observation

The first model I ran was a simple regression, I picked GDP2018 as dependent variable and GDP
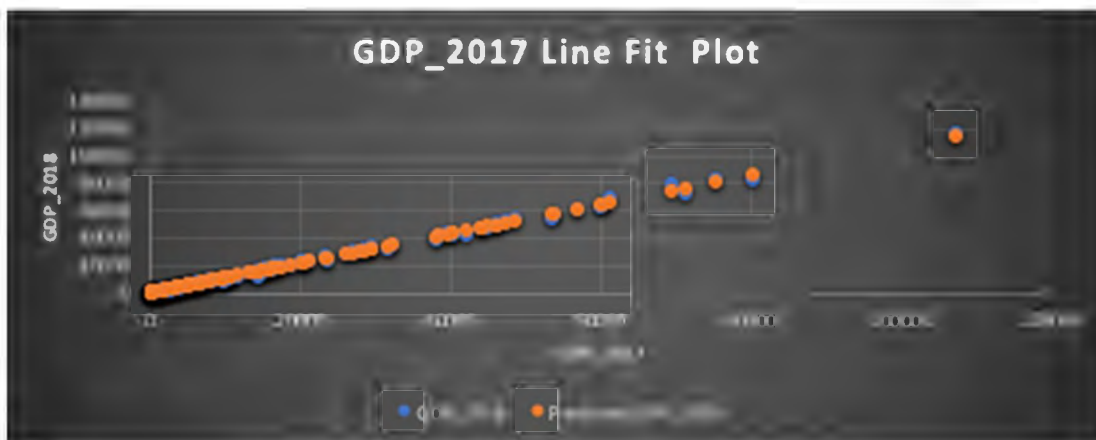
2017 for my independent variable.

The equation of the model GDP_2018= α + β * GDP_2017

Here is the scatter plot that shows the strong correlation between the two, which is expected,

because the GDP of the country is directly related to the previous year's GDP.
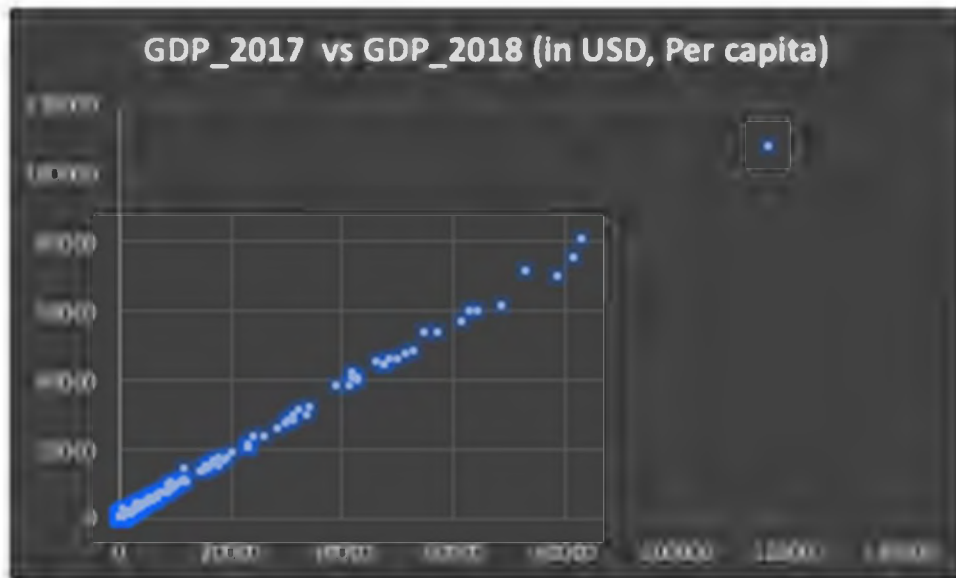
As expected, the high R-square (0.9979) indicates that indeed the GDP 2017 itself is a very good predictor of the GDP in 2018. The extremely low P-value (2.2269exp-226) also confirms the significance of the correlation. This can also be visually confirmed by the plot of predicted values vs the actual GDP (below image), the predicted values are covering the actual GDP for most cases.

Second model: GDP_2018 $= \alpha + \beta1 * $ GDP_2017 $+ \beta2 * $ CPI_2018

For my second regression I added the corruption perception index as a second independent variable. The results were mostly along expected lines, the R-square value indicates that this model is also a very good predictor of the 2018 GPD and is slightly better than the previous model. However, the improvement is only very minimal (0.99795328 vs 0.997948537). The coefficient for the corruption index is -3.972439219, note this is negative. This makes absolute sense, because as mentioned earlier the CPI is a score on scale of 1 to 100, with score of 100 being perceived as no corruption at all. Denmark which sits at the top of the corruption index rankings (least corrupt) has a score of 88. So, the higher the corruption score the better the country is, and this indirect relationship is reflected in the negative coefficient. What is also important is that a P-value for a corruption index is greater than 0.05(0.5356), which means this factor is not statistically significant enough.

The equation for my third model was GDP_2018 $= \alpha + \beta 1 *$ GDP_2017 $+ \beta 2 *$ CPI_2018 $+ \beta 3 *$ PSI_2018.

I added political stability as my third indicator. The R-square is even better than the previous models. Though, the improvement is minimal (0.997968356 vs 99795328), it is to be noted that P-values are greater than 0.05 which tells that these two factors are not statistically significant enough in this model either. In short, while adding the corruption indicator and political stability does improve the model and gives us a better prediction of the 2018 GDP neither of these indicators are statistically significant enough.

Due to lack of significance of corruption and political stability I added a dummy variable in my next model only for developed countries, so the dummy value was 1. Is it possible that

corruption impacts developed countries less than the other countries? We will find out. The regression equation for this model is:

$GDP\_2018 = \alpha + \beta1 * GDP\_2017 + \beta2 * CPI\_2018 + \beta3 * PSI\_2018 + \beta4 * Dummy\ variable$

The output of this regression was really interesting. For starters the R-square is even better than the previous three models, so as we are adding additional variables the model is becoming a better predictor of the 2018 GDP and gives us a better picture about corruption and its impacts. But more interestingly, the coefficients and P-values also tell us something engaging. The strong positive coefficient for the Dummy variable confirms that developed countries do get that extra bump (455.014 in GDP) compared to the rest of the world. More developed economy means more freedom (Coyle, 2014, pg.127) With more freedom we would expect less corruption as well and that is the case in this model. Also, the P-value (0.066), while still not less than 0.05 tells us that this indeed is close to being statistically significant, closer than in the previous models. The most important outcome from this model for me was the P-value of the corruption variable 0.127350243, this value is significantly lower than the P-value from the previous model. What this tells is that – the Corruption Perception Index becomes more statistically significant based on the economic status (developed or not) of the country. At the same time, the political stability becomes less statistically significant as we introduce the dummy variable into the mix. To do a further deep analysis, I split this model into two separate models. I created one dataset with only the countries that are 'Developed' and another dataset with all the remaining countries and removed the Dummy variable from my model. What I found was that the P-values are significantly lower for the developed countries compared to the rest of the world. This tells us that corruption plays a more statistically significant role in impacting the country's GDP when compared to the rest of the world.

So far, all the models that I looked at were trying to predict the GDP for 2018 and to prove how corruption affects economic growth using the GDP of 2017 as one of the independent variables along with a combination of other variables. As we know, year over year there is a very strong correlation between the GDP of any country. My thought was that this correlation is so significant that it may exceed some of the other statistically important relations between other variables. More importantly, I wanted to find out what the corruption index would be if I took out the previous year's GDP. To do this, I now looked at the Corruption Perception score, political stability, Dummy variable and employment participation rate to find if these four can be used to predict the year end GDP with any level of accuracy.

My regression equation now looks like this:

$$GDP\_2018 = \alpha + \beta1*CPI\_2018 + \beta2*PSI\_2018 + \beta3*Dummy + \beta4 * EmpParticipation\_2018$$

The first thing that stands out is that the R-square is no longer close to 1, from around 0.98 it drops down to 0.69. This makes sense, because we removed the most effective variable (which is the previous year's GDP). However, the P-values now paint a different picture. I see that the p-value for corruption is significantly less than 0.05 (4.34 exp-16), this tells us that-corruption is a statistically significant variable impacting GDP of a country. Also, I noticed that the p-value is low for the dummy variable as well, indicating that it is also a statistically significant variable. The p-value for employment participation (0.06) is just about the level where we may consider it as statistically significant. By removing the previous year's GDP, the coefficients changed drastically.

The table below summarizes the results of all the regression models that I ran, notice how the statistical significance of corruption and developed status (Dummy variable) increases

significantly in the last model.

| Model # | Dependen1 Variable | Independent Variables | R-square | GDP-2017 | P Value | | | |
					Corruption-2017	PolicitalStability-2018	Developed	EmployeePartic ipation2018
1	GDP2018	GDP2017	0.997948537	2.2269E-226	-	-	-	-
2	GDP2018	GDP2017, Corruption2018	0.997968356	9.67E-187	0.246600371	0.270235779	-	-
3	GDP2018	GDP2017, Corruption2018, Political Stability 2018, Developed	0.998009719	2.3923E-182	0.127350243	0.293864851	0.066670576	-
4	GDP2018	GDP2017, Corruption2018, Political Stability 2018 (Developed countries only)	0.996487208	1.52642E-34	0.117403159	0.48479334	-	-
5	GDP2018	GDP2017, Corruption2018, Political Stability 2018 (Rest of world)	0.996608992	3.2811E-146	0.267103101	0.463738618	-	-
6	GDP2018	Corruption2018, Political Stability 2018, Developed, EploymentParticipation2018	0.691161181		4.34959E-16	0.114141819	4.46116E-06	0.060183813

Conclusion

My analysis of the five regression models has helped to confirm some of the assumptions that I started with about the relationship between different econometric variables. It is no surprise that the biggest predictor of a country's GDP is its past GDP performance. However, corruption does play a role in how the country's GPD grows, though this impact is not statistically significant. Also, corruption plays a more statistically significant role in impacting the country's GDP for developed countries compared to the rest of the world. If you ignore the previous year's GDP, the accuracy of the prediction model does drop significantly. The academic sources and my models reaffirm that there does exist a relationship between corruption and economic growth, a negative correlation and surprisingly the relationship is statistically more significant in the case of developed countries.

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Appendix

A. Data sources

Corruption perception index - https://www.transparency.org/cpi2018

Employment participation rate - https://data.worldbank.org/indicator/sl.tlf.cact.zs

Political stability - https://www.theglobaleconomy.com/download-data.php

Per capita GDP - https://data.worldbank.org/indicator/NY.GDP.PCAP.CD

List of developed countries -

https://www.un.org/en/development/desa/policy/wesp/wesp_current/2014wesp_country_clas

sification.pdf