An Inquiry to Government Involvement in the Economy and its Effect on GDP Growth

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Abstract

This paper's goal is to analyze whether government involvement in the economy yield higher growth in comparison to its peer countries. Analyzing data from the World Bank Group and referencing classical economic theories, we compare the two competing theories of Keynesian and Austrian school of economics to determine which set of economic policy would achieve higher economic growth and to determine if either of the two economic theories were correct in their theoretical statements. Our analysis shows that countries which had their market intervened with government policies yield lower growth than their peer countries which had their government not intervening in their market activities. Our analysis proved that Austrian economic policy does result in higher growth, while Keynesian economic policy would be more useful as an instrument of economic control.

Introduction

The concept of market interaction can be traced back as early as the first written record. In fact, the oldest written language in the world, the cuneiform, began as a method to record financial transactions between two parties. In 1776, Adam Smith set out to explain how the market forces influenced the decision making of individuals. In his book, *An Inquiry into the nature and causes of the wealth of nations*, Smith mentioned that the market was guided by an "invisible hand". That is, when the people demanded more goods, the supply for the desired goods must also be increased in order to satisfy the demand, and further stabilize the price for the entire market.

Adam Smith's theory of the market economy and the *invisible hand* guiding human rationale, were the founding principles of modern economics. The Austrian school of economics further describe the market forces phenomenon in a more detailed fashion. The school described that market economy as it is has generated a more wealthy society and shall be left alone to work out its flaws. This is where the concept of market *boom-and-bust* were born. It describes that in general, every economic system must go through a continuous cycle of expansion and recession as a healthy part of the overall system. Such phenomenon, according to the school, is required in order to generate continuous wealth.

In 1929, in the wake of the Great Depression, the Austrian School got its first test of their economic policy. The Great Depression, according to the Austrian School, is just another economic recession as what had happened many decades before. But as many historian and analysts had described, the Great Depression of 1929 is one of the worst in history and one with the greatest consequences. This event questions causes questions to be raised on the Austrian

School. Typically, a normal recession lasts for 12 to 22 months. In 1929, the recession lasted for 44 months. This unusual length of recession sparked many economists to question whether the current understanding of economics of boom and bust, is worth the suffering and pain many people experienced. One of those economists who questions the theory was John Maynard Keynes of Cambridge.

The Great Depression of 1929, as many analysts had agreed upon, were caused by oversupply of goods in the market, causing prices to drop very rapidly to the point where businesses were not able to meet their break even point (a point where generated profit cannot cover the cost of production). With an oversupply of goods and business inability to generate profit, demand falters, which creates a market where nobody was actually buying anything. The demand for goods in 1929 essentially dropped to 0 percent. The Austrian school believed that the market will correct itself where supply and demand will come to equilibrium once again, as was the case for many centuries. John Keynes saw this differently.

Keynes viewed that if the forces of the market were to be left alone to correct itself, *"In the long run, we are all dead"*. In other words, this process might simply take too long. Keynes argued that it was insufficient for economists and policymakers simply to advise people to accept suffering in the short and medium term, secure in the knowledge that in the long run, the economy will be back on track. Keynes thus argued, what was needed was an intervention in the economy by the government, in order to break the cycle of economic depression and thereby restore prosperity. Keynes also argued that if the market mechanism to stimulate economic recovery were unable, then it was the job of the state to step in to create demand by running a very large deficit in order to achieve the stated goal.

The problem with Keynes solution, however, is that often times government induced demand were in the form of public works or the formation of government agency which were tasked to create social safety nets around it citizens. Such programs are large enough to stabilize the economy, but also too costly for any sitting nor running political establishment to abolish as the termination of any of these program would be perceived as cruel or impopular policy.

We can also observe some occurrences where in order to generate more revenue or to fulfil a political promise, government would still intervene the market by again generate large deficit or set taxes to some sectors of the market. These actions were the very things Austrian School of Economics do not wish to occur as they see it as a unhealthy slow down of wealth generation by the government who had the choice not to intervene in the first place.

But many analysts agree that government intervention in the market is necessary in order to create a stable economy and reduce the extremity of economic booms-and-busts. There are even many countries that openly intervened in their market economy, yet were able to generate great wealth and growth. This discrepancy between theory and result had caused much heated debate in countries around the world, where the choice of economic policy became the trend for many years to come.

As Keynesian Economics had became the trend of the century since the end of world war 2 to date. We then ask ourselves: Was it true, that government intervention generates higher wealth and not the opposite? We feel this question is one of oldest unanswered question in economic science, and careful analysis would lead to numerous advancement inside economic science such as: How to entice rapid growth, how to effectively manage macroeconomic factors, which type of country is the better investment destination, etc.

Our analysis have found that in order to generate higher GDP growth in an economy, the government need to let the market forces work on their own. We have also found that while government involvement does lower the GDP growth of a country, we found such policy is necessary in order to control the growth of the market. In the following chapters, we will demonstrate how our analysis was built, why a certain dataset was chosen, what is our hypothesis, and what does our result demonstrates. Although our result confirmed our hypothesis, we are unable to confirm its validity mathematically. One of the reasons were the lack of extensive data and sample countries we were able to collect, and as a result, our z-score failed to exceed the critical point of the hypothesis test.

Problem Definition

In this paper, we are set to explore the question of whether government intervention in the market generated higher growth than the free market policy of the Austrian School of Economics. We would also like to find anomalies or outliers on our result, so we can analyze why it happened and what does the country's economic policies looked like. We feel the stated questions is an important question to ask in order to generate a more insightful investment decision, standardized the measurement of country's economic performance, and even forecast its a country's growth in any given time range. We also hope that by answering the question of *"which economic policy is better"*, we would put one of the oldest question in economic science to bed, and provide guidance for any government's economic policy which can be tailored to their respective needs.

Models/Algorithms/Measures

We start our analysis by defining what our hypothesis would be. In order to proof the correctness of one side, we arbitrarily chose to position ourselves in the the side of the Austrian economics, where the market shall be left alone in order to generate growth effectivelty. We rewrite this as:

μ_0 : *Average GDP Growth*

μ_a : *Low Government Involvement produces higher GDP growth*

As our analysis is very tightly connected with the problem of Government Intervention. But such term by nature is a qualitative term and would be very difficult to quantify. According to Gwartney et. al. (2015), in order to quantify the term "government intervention", one would have to consider the following:

- The size of Governments
- The Legal System and Property Rights
- Money Growth
- Freedom to Trade Internationally
- Regulations

After careful analysis on the dataset we have collected, how one sector interact with the other, and which sector dealt more in terms of pure economic science than political, we have came into a conclusion that essentially the sector we would be only interested in was The size of governments, which consists of :

- Government Consumption
- Government Transfer and Subsidies
- Government owned enterprise and investments
- Government Tax rate and their revenue.

We took the decision of only taking one category out of five because 1) The category of *Regulations* and *Legal systems and property rights* by the nature of its dataset are more political rather than economic, and political trends changes relatively quickly than the economic fundamentals of the state. 2) The money growth sector were tightly correlated with the growth of GDP of the state in which we will compare the result of the above analysis with. 3) The category *Freedom to Trade Internationally* is already covered in the tax revenue as trade barriers were often times enforced as tariffs, which contributes to the final tax revenue in accounting books.

In order to group the countries into two categories (Low Government Intervention & High Government Intervention), we shall use the K-Means clustering algorithm. Utilizing the econometrics mentioned above, the result of the clustering algorithm would return a list of countries with their respective clusters. These clusters then can be used to calculate our z-score in order to reject our null hypothesis.

We obtain our datasets from the sets given by the World Bank Group as we have found that the data from this source as the most complete and extensive in terms the number of years it was collected. Another piece of data that we add into our collection of datasets were the GDP growth of countries ranging from 1980 to 2015. We will use this data in later part of the chapter to compare the performance of each group of countries. We also collect the list of predetermined developing and developed countries compiled by the United Nations.

Implementation

After analyzing the datasets and literature available, we set ourselves to do the analysis on the data. We are to analyze the data in these steps:

1. Combine all the 4 econometrics data into one dataset, with one the econometrics as the header and the countries' as index.
2. Split the list of countries into two sets: Developed Countries and Developing Countries.
3. For each sets of countries, perform K-means clustering (2 clusters) with the 4 econometrics as data points.
4. Analyze the cluster's economic performance by comparing the GDP growth with each other. Find outliers.
5. Perform hypothesis testing.

Data Frame Creation

In order to utilize the K-Means clustering with SKLearn library, we combine the datasets containing the data on government consumption, transfers and subsidies, national enterprises, and tax revenue into one dataframe and set the respective country's name as index.

```
In [72]: developed_countries_df_2013.head()
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Out[72]:

country	govt_subsidies	govt_consumption	state_owned	tax_revenue
Austria	33.464398	19.915943	16.09	26.415173
Belgium	37.012686	24.490786	20.94	26.187835
Czech Republic	21.670626	20.155642	19.05	14.946434
Denmark	6.532285	26.007513	9.14	33.819753
Estonia	1.348904	18.846604	3.21	1.287457

Exhibit 1: Main Data Frame used for clustering (Data frame for developed countries shown here)

Data Split

After the creation of the new dataset above, we then split the data into two categories. Developed and Developing countries. The reason for the split is because it would be unfair to compare developing countries with developed countries as the two have different economic and political standards. Moreover, GDP growth in developing countries are significantly higher than of the developed countries. Thus comparing the GDP growth of the countries without splitting it into two categories would create a bias in our data skewed towards the developing countries as it has a much higher sample than developed countries

K-Means Clustering

Once we have the data frame ready, we then perform K-means Clustering on the dataset. Note that with 4 econometrics involved, we have 4 dimension cluster. We utilize SKlearn clustering library for our clustering, where it then return a list of countries in the categories of High Government Involvement, and low government involvement.

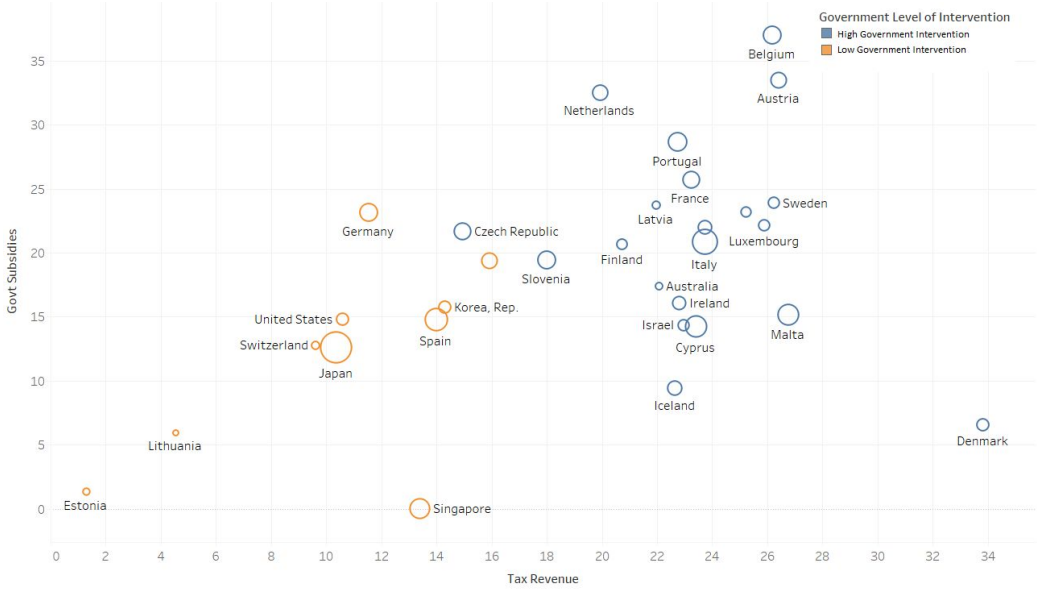

Exhibit 2: K-Means clustering result. Recreated in Tableau (content does not represent actual result).

GDP Comparison

Using the result from the clustering algorithm, we gather the GDP growth and calculate the average of each category. We summarize the statistics gathered in the table below:

	Developing Countries	**Developed Countries**
2013	Low Govt Intervention = 4.72%	Low Govt Intervention = 1.22%
	High Govt Intervention = 3.38%	High Govt Intervention = 0.39%
	Growth Mean = 4.45%	Growth Mean = 1.06%
	Standard Deviation (Low, High) = 3.78, 2.54	Standard Deviation (Low, High) = 1.79, 3.9
2014	Low Govt Intervention = 3.79	Low Govt Intervention = 2.59%
	High Govt Intervention = 3.17%	High Govt Intervention = 0.62%
	Growth Mean = 3.69%	Growth Mean = 2.4%
	Standard Deviation (Low, High) = 2.08, 0.54	Standard Deviation (Low, High) = 2.67, 2.29
2015	Low Govt Intervention = 3.27%	Low Govt Intervention = 3.18%
	High Govt Intervention = 3.42%	High Govt Intervention = 3.52%
	Growth Mean = 3.29%	Growth Mean = 3.24%
	Standard Deviation (Low, High)= 3.16, 2.9	Standard Deviation (Low, High) = 3.16, 4.64

Table 1: Aggregate economic growth from 2013 - 2015

Hypothesis Testing:

$$z = \frac{\bar{x} - \mu_0}{(\frac{\sigma}{\sqrt{n}})}$$

In order to test our hypothesis, we test our result by performing z-test on our data. The above equation is the equation to perform z-test where $\bar{x}$ median of the aggregate data, μ_0 the value of the null hypothesis, σ the standard deviation, and n the number of samples. Unfortunately, given the data we have right now, our Z score did not exceed the critical point of 1.64 for all categories. Thus, we cannot confirm the result of our analysis mathematically.

Calculation example:

Calculating the statistics from Developed Countries with low government involvement in the year 2013. Given $\bar{x}$ = 1.22%, μ_0 = 1.06%, σ = 1.79, n = 31. (Refer table 1).

$$z = \frac{\bar{x} - \mu_0}{(\frac{\sigma}{\sqrt{n}})} = \frac{1.22 - 1.06}{(\frac{1.79}{\sqrt{31}})} = 0.49$$

Z score result is below the critical value of 1.64, therefore we do not reject the null hypothesis.

Results and Discussions

We have demonstrated our methodology and subsequent result of each steps. As described in Table 1, our analysis came into a conclusion that countries that have low government intervention in their market have consistently yield higher GDP growth above the average and their peer country that have higher government involvement in the economy.

Developed countries:

In developed countries, we observed that the average GDP growth in this category to be on average 3.36% per year. For countries with high government intervention, we have found their GDP growth to be 2.5% per annum while countries with low government intervention yielded an average of 3.53% GDP growth per annum, outperforming their peer countries by 1.03%.

Developing Countries:

In developing countries, we observed that the average GDP growth in this category to be on average 2.68% per year. For countries with high government intervention, we have found their GDP growth to be 2.33% per annum while countries with low government intervention yielded an average of 2.76% GDP growth per annum, outperforming their peer countries by 0.43%.

We observed that the GDP growth of nations from 2013 to 2015 have favored economies with low government intervention, except on 2015 where we observed a reversal on that trend. We conclude that this reversal is a normal policy decision in order to prevent an overheat on the economy. Central banks normally would increase interest rates or expand tax brackets in order to slow aggregate production so that the purchasing power of their market could catch up with the growing supply of goods.

In terms of outlier countries, we observed no interesting country which outperform their peers. Countries during the period of 2013 - 2015 which were categorized as an outlier had extraordinary circumstances such as war, debt crisis. Greece and Ukraine for example, yield a negative GDP growth from 2013 to 2014 as a result of debt crisis and war, respectively. The only country that we observed a stable growth from a rapid peak is the Republic of Paraguay, where

in 2013 yield a 14% GDP growth after it enters the international bond market, and had achieved a stable 4.00% growth every year since. Paraguay was categorized as an economy that has low government involvement from 2013-2015, and we think this is a interesting country for further research in economic analysis.

Our hypothesis testing have not yet confirm our finding. We suspect we lack the necessary data to perform our analysis as the number was part of the final calculation where it is placed as the denominator. Thus, a higher number of samples in the future should be able to reject the null hypothesis. We acknowledge the fact that the raw dataset provided from the world bank does contain data that ranged from 1960 through 2015. But, the same dataset lacked a continuous information on a country's economic progress. Also, there are countries that does not provide certain econometrics that are important in our clustering process. For example, India does not have a continuous data in the year 2012, 2016, and 2017. We feel our decision to left out countries with ambiguous or blank data is a better decision than including them because these "broken" data points might interfere with the clustering centroid calculation, which might result in bad clustering overall.

As a result of the above analysis, we observed that countries that yield higher GDP growth relative to their peer countries had the quality of low government involvement in the economy. Although we observed a reversal of the trend in 2015, we think that this reversal was a result of policy decision by the governments in order to prevent economic overheat. Since our P-value does not confirm our conclusion at the moment, we do not wish to further conclude that we have confirmed our hypothesis, rather, we encourage further research on the field with more

extensive data and complete datasets to calculate a better p-value and test against our hypothesis, as we think the reason why our p-value reject the null hypothesis is because the lack of data.

Related Works

Our analysis on government involvement in the market was mainly inspired by the political rhetoric of our day and the heated debate between Keynesian and Austrian school of economics. There are a lot of works that strive to answer the same question as ours. Dr. Yasheng Huang of MIT, did an analysis on the question of why democracy seemed to stifle economic growth. In his research, he performed the analysis in the perspective of psychology, education, and behavioral economics. The same economic analysis was also performed by Mr. Eric X. Li of Chengwei Capital. In his analysis, mentioned compared two major political systems and its result on the citizens wellbeing.

Our analysis is unique as we utilized data science in order to discover meaningful pattern. The methodology we used is capable to discover more patterns in the economy given enough datasets. Note that our cluster were the result of 4 variables, and we covered a lot of questions in our economic analysis. We think the capability to discover more patterns with more data will be very useful in future work in the field of economics, since the field itself currently dealt with big amounts of data, but not a lot of computing and brain power to process them.

Conclusions

We have found that Government involvement in the economy would yield lower growth. We conclude that in order to generate rapid growth, government need to stay out of the daily business of market transaction and let the "invisible hand" create wealth for the whole nation. We also conclude that government involvement would only yield lower performance, as demonstrated in 2015 where we saw a reversal of the GDP growth trend, caused by government policies which slowed down economic growth by implementing policies that interferes with the market.

From the analysis above, we confirm our original hypothesis, but since we cannot come to a p-value that rejects our null hypothesis, we do not think at the moment that we can confirm its mathematical validity. Thus, at the moment, we cannot completely put the debate of Keynesian vs Austrian economics to bed. We encourage further researchers in the future to pick up where we lack and perform a much more deeper analysis with more extensive and complete datasets.

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