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2018

FDI and Economic Growth: A Case Study From China and Africa

CHARLES GOLDBERG

This thesis is submitted in partial fulfillment of the requirements for the course Senior Seminar (EC 375), during the Spring Semester of 2018

While writing this thesis, I have not witnessed any wrongdoing, nor have I personally violated any conditions of the Skidmore College Honor Code.

Name: Charles Goldberg

Signature:

Abstract:

This paper investigates the long-debated relationship between FDI and economic growth. I use a Solow model framework to analyze this relationship. Further, I use OLS regression analysis to analyze this relationship, specifically between China and Africa. The Chinese-African trade relationship has become dynamic and expansive. I come to the conclusion that FDI doesn't have a significant effect on economic growth in this case, and further conclude that trade relationships and policy are more important for economic growth, and can aid in determining the future value of an economic structure.

INTRODUCTION

In 1978, reformists in China's communist party began to open the Chinese economy. They decentralized agriculture and opened the economy to foreign investment, while also allowing new market entrepreneurs to begin business activity. Though much of the country then, and now, remained state-owned, the roots of a market economy began bubbling up from underneath the People's Republic of China. Through the late 1990s, China began to privatize many of its businesses, and by 2005, 70% of China's GDP was through the private sector. Today, China is quickly approaching the U.S. in GDP and is projected to surpass it by 2028. China's new market economy has experienced a rapid shift since its inception, and has continued to expand into new markets in an attempt to gain more opportunity for expansion.

The point here is that China's economy is a force that will continue to grow and expand for many years. This paper will seek to in some way determine the strength of their economy's investments as they relate to African nations. There has been a surge in investment activity flowing into Africa from China in recent years (see figure 1). The Chinese government is projecting \$1 trillion of funding to the African continent over the next 8 years. This swift uptick in Chinese FDI on the African continent has certainly been under an amount of scrutiny. There are worries from the local African markets that China is taking advantage of them, sucking the raw materials and cheaper labor right from underneath them. While other believe this aspect of Chinese investment can be attributed to China's foreign aid policies. This paper seeks to understand not the "why" but the "result" of the substantial amounts of capital running through China and into Africa. Using the Solow Growth model framework, I will attempt to understand the factors of economic growth within these nations in Africa, and how China has potentially spurred growth in these areas.

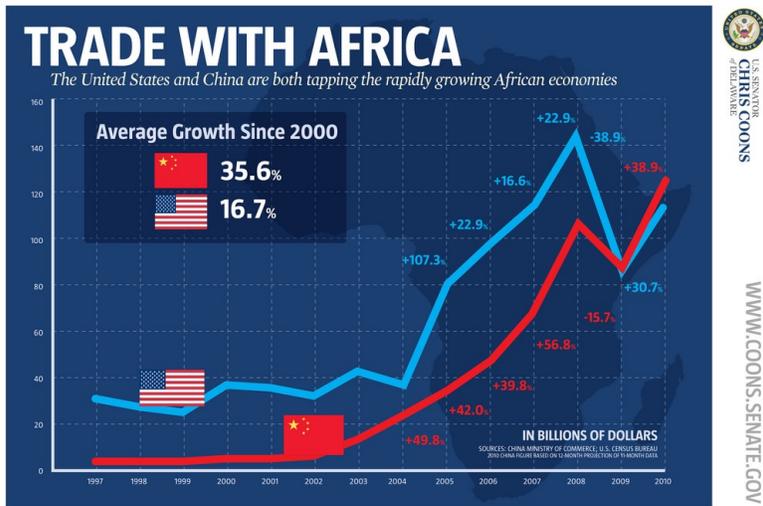


Figure 1.

This trade relationship between Africa and China has many different levels to it. For one, China is interested in the vast supply of Africa's natural resources which double as raw materials for many of the goods that China mass produces globally. This aspect of trade has been consistent between the two economies for many years, yet skeptics believe that China may be trying to improve the channel in which the raw materials travel back to Chinese factories. Expediting this process by taking control of areas where these raw materials are mined could be a key way for China to position itself to cut cost.

Another interesting aspect of why we may be seeing the influx of investment in Africa could be because of China's rising wage costs. They may feel that by exporting their labor to cheaper Africa, they can deal with rising wage costs in China. Other nations have started to transport their labor to other manufacturing hubs given China's rising wage costs.

This paper will do a couple of different things that by the end I hope to conclude. One thing I want to be able to do understand the implications of foreign investment on emerging economies. Another idea I will shed light on is the potential "investability" of an economy based on the factors that contribute to economic growth. This paper may be able to introduce topics

¹ Figure is from www.cons.senate.gov

that are significant when looking to invest in a certain economy from an individual or institutional level. If there are aspects seen through this research that point to high volumes of economic growth, it could signify those economies as worthy investments.

Now that I've outlined some of the reasons why China may be so interested in Africa, I will now showcase my research relating to the effect that investment has had on African nation's economic growth. This important topic will hopefully reveal substantial information regarding the Chinese-African trade, while also shedding light on the long debated relationship between FDI and economic growth.

LITERATURE REVIEW

My project is concerned with the relationship between economic growth and FDI. Prior study on the subject has consistently been back and forth on the matter. All in all, most literature surrounding the subject has come to an agreement that FDI is certainly an important factor when understanding economic growth. The formation of this literature review will essentially go essentially in a chronological order, discussing the variety of opinions that have shaped this area of economic study. It will then move closer in scope to look at more recent literature aimed at the relationship between China and Africa. My paper will seek to conclude the relationship between growth and FDI, using the African-Chinese blossoming and dynamic trade partnership as a case study, and discuss the potential factors as to why we may not see this relationship play out as it seems. I will go through the theoretical frameworks that are considered when looking at FDI effects on economic growth, and then will shape and narrow my focus to Africa to apply the concepts there.

The dedicated research surrounding this theme in economics has deep roots, on both the positive and negative empirical side. Borensztein et al., 1998 discusses empirically the effects of FDI on economic growth in 69 countries ranging from developing to developed. This paper tests the significance of FDI on economic growth, using a regression analysis that includes major GDP factors of growth, education (for human capital) etc.. They find a positive overall effect on economic growth in the study, yet the magnitude depends on the stock of human capital in the host economy. They find that countries with very low availability of human capital, the direct effect of FDI is negative, and oppositely for a large amount of human capital available.

This paper fails to consider technology as a means to increase an economies capabilities on a firm level, essentially raising available human capital. Further, they are assuming a linear interaction with their model, where in reality, this relationship is most likely non-linear. There may be traces of threshold effect that effects the validity of these statistics. There are also issues in their determinants of excess FDI. There is an assumption that FDI leads to economic growth, whereas there is a simultaneous increase in excess FDI while an economy is growing, assumingly. So here lies another endogeneity problem.

I will add to this literature by updating the time period. The variables used in this study do a good job at describing general growth model variables, yet I want to expand my scope to look at a larger aggregation of these statistics. Further, by looking at the China-Africa case study, I will be able to predict China's opportunities moving forward in Africa, and use these principles to either negate or accept China's rhetoric on the purpose of their surge in investment in Africa. By focusing in a particular case study, I'm also able to propose policy ideas and implications for both China and Africa on the basis of these statistical results.

Another well-researched strain of the literature revolves around the pre-conditions of economic activity. This literature was meant to piggyback off of the existing (Borensztein et al., 1998) literature to include for conditions that allow for economic growth based on FDI. This theoretical approach tries to illustrate some of the endogenous factors that play into the ambiguity of the relationship between growth and FDI, and flesh them out. Many authors have explored the pre-conditions to FDI, and the conditions necessary to fully take advantage of this foreign investment (Hermes and Lensink, 2000 and 2003). Much of the past literature has focused on contingency effects as it relates to FDI and growth. This paper concludes that it is ambiguous whether or not contingency effects in economies transfer to economic growth stimulated by FDI. That is to say that growth related to FDI is contingent on whether or not the individual, micro-level economy is developed enough to fully absorb the value of FDI. This vein of literature has previously consumed the overall opinion, depicting an empirically ambiguous effect. There is a lesser quantity of papers that look at FDI-to-economic growth relationships (Alfaro et al., 2004) in accordance with these theories of pre-conditions of established financial landscapes. This paper moves deeper into the effects of the financial markets on FDI and economic growth.

Alfaro et al. (2004) uses financial markets to extrapolate the limitations of the relationship between economic growth and FDI. The article discusses the shift in the late 1990s with policymakers of smaller nations, and how that shift has led these policymakers to increase trade flow from more developed nations, therefore increasing their FDI. They use a linear interaction model to illustrate their statistical outcomes.

It also discusses that past studies have proven that although the relationship between FDI and economic growth is ambiguous, that more well-developed countries promote economic growth at a much higher percentage than lower-developed nations. They examine whether or not this theory is true; that a more developed financial market is able to more fully benefit from FDI. They also propose and theorize that smaller economies that are less modern and efficient will struggle to deal with short term capital flows, not truly being able to efficiently allocate resources and assets. Further, they introduce how knowledge spillovers are not as effective or present as people believe. While the general thought may consider this an easy thing to comprehend, this paper argues that it again depends on the economy's willingness and ability to allow for new knowledge. It works similarly with tech. Though this paper is dated, they discuss the impacts of new tech in these economies. They argue that economies that are not willing to accept and transition into new behaviors, and are unwilling to utilize FDI in an efficient way, they will never gain access to the same efficiencies that FDI may lend, nor the technology it has the potential to increase. Looking at the Solow growth model, technology is an element that contributes to growth, in both labor and capital. In this study, the use of labor will be an incorporated into my own study based on how direct the relationship is between labor efficiency and economic growth.

Interestingly, they found that there is a large variation between countries with similar, proportional level of FDI on economic growth. Given that they use a very disperse range of economies in terms of development indicators, it illustrates that there is a very significant factor underpinning the large differences in growth within these economies.

An issue with this paper was that it was unable to include all aspects of endogeneity, which they identified as well. The greatest factor being institutional law.

This paper uses data from 1975-1995, which precedes the dot-com boom. This I found to be a problem because they had trouble including factors such as technology spillovers that come along with FDI from more developed countries and economies. They were able to theorize that

countries with less access to technology will be unable to adopt efficiencies, therefore rendering them unable to utilize foreign investments to increase growth. It is difficult to quantify those effects even in today's world, but this gap in time will be an addition I make to this literature. Updating the data will be important in understanding whether or not this relationship between FDI and economic growth is significant, while also necessarily controlling for such things like endogeneity and technological progress.

There are other papers that use Alfaro et al.'s basis to move to other directions (Azman-Saini et al., 2010, Madani, 2014). Azman-Saini et al., 2010 builds off by noting the particular limitation with the linear interaction model used in Alfaro et al., 2004. It discusses that the descriptive statistic used doesn't take into account the flexibility to accommodate different FDI-growth to financial market interactions. To correct for this, they use a piecewise regression model to illustrate threshold effects. This is to say that they find that the relationship between economic growth and FDI "kicks in" after financial development reaches a particular level. They coin this, the "threshold level." By doing this, they are able to empirically test where the existence of the threshold effect takes place, and the significance of it. They believe that by splitting up the equation into a piecewise function, more aspects of financial development will be able to be tested for. This paper is an important step in realizing the impact of FDI given financial market constraints, something that had previously been untouched.

They find a significant threshold effect occurrence, rejecting their null hypothesis. This confirms that given changes in domestic financial markets, the threshold effect changes. They further conclude that policy implications should include both policies to encourage FDI, but to go hand in hand with policies that allow for domestic financial market growth.

Their data only goes up to 2005, so there is considerable space for me to fill in with my project. Further, I found that they didn't use enough variables to fully characterize growth. It seems that they used a simple solow growth model ideology to create their variables. By not using a more diverse set of variables, I think they lost out on concluding more concretely what formulates growth.

Other literature focuses more on the spillover of technology and its relation to growth in accordance to standard solow growth theory (Nobakht et al., 2014). This paper dives into the spillover effects of FDI, conditional on financial development and trade openness. This paper focuses on upper-middle income countries (UMCs) as the case study. This differs from my

empirical design based on the case study being looked at. I will be using the Chinese-African trade as my case. Further, this case study is used so as to eliminate the potential for homogeneity in the data, given that there is a large disparity of FDI inflows within the sample. I shouldn't have any issue with homogeneity either, given the diversity of countries on the African continent. This paper further argues that a more advanced, efficient financial market allows for a the reduction of risk to upgrade and adopt new "technologies." The linkage here is between the increased technological spillover, and economic growth. Most literature, including this paper, agree that FDI's main component and addition towards economic growth is the contribution towards technological progress. This ideology is based in the solow model, where technology increases capital efficiency, which drives economic growth. If this link holds, this is truly where FDI effects economic growth. The paper further suggests that with a more effective financial market and economy, there is less effect given to the crowding out theory. This idea combats other literature that illustrates significant effects of FDI on crowding out effect (Wu et al., 2010) that talks about crowding out effect in terms of domestic investment, which is relatively concrete.

Ul Haque, 2016, describes technology's role using Pakistan as its case study. Given that a country's per capita income is based strictly on labor productivity, they discuss the importance of technology as the driver for productivity.

$$\text{Per capita income (Y/P)} = \text{labor productivity (Y/E)} \times \text{employment rate (E/N)} \times \text{labor force participation rate (N/P)}$$

This above identity proves how imperative labor productivity is for economic growth. It's important to note the direction relationship this has on growth, when looking at factors of economic growth. The relationship here bleeds into FDI literature as I've previously mentioned in talking about FDI as being the best explanation for spillover effects in technology. This influences me to include a variable based on technology, or technology growth, to perhaps illustrate the indirect relationship FDI has on technological progress, which I could then make the connection to economic growth.

It suggests that the relationship between China and Africa, though it may correlate to higher African economic growth, is not necessarily to increase foreign aid to prop up African

economies. The theories surrounding the importance in local economic development, and the ability to capture the intrinsic value of FDI, create a potential flaw in the literature that doesn't control for these factors of endogeneity.

In looking at general themes of FDI research in Africa, many newer publications have been involved in this strain of research. The overarching ideas revolve around the positive economic impacts created by Chinese FDI on the African continent. There is an ambiguous relationship between Chinese FDI in Africa, and African economic growth, that has become a serious aspect of economic research (Doku, et al. 2017). In this study, the authors describe the channel of investment between Africa and China, and offers insights as to why this may be the case. They look at some of the key economic variables involved in economic growth such as GDP, CPI, labor participation rate etc. These measures gain insight into what aspects of Africa's economy may be affected by Chinese FDI. The results show a positive correlation between Chinese FDI and Africa's GDP. They find that a 1 percent increase in China's FDI stock in Africa increases Africa's GDP by .607 percent. They also find an inelasticity of China's FDI on Africa's GDP growth to be .007. This signifies a situation where a slight change in FDI will have a somewhat significant impact on African GDP.

They argue that a less bureaucratic process for Chinese investors to involve themselves in low trade costs and free visas should be in the system.

This paper dives into only sub-saharan Africa and looks at a sample of 20 countries. I will differ from this by including all African countries where data is available. This also contributes to a setback in this study. Because they do not reach a greater percentage of African nations, there is the potential to be less significant in their conclusion. This is something I see in much of the literature surrounding this topic. Though their conclusions do successfully fit their initial hypotheses, this drawback definitely doesn't allow for as much result-oriented statistics in a conclusion. Another drawback to this study was the inability to check things such as currency, political instability, and lack of investment energy. These ideas broadly count as deterrents of investment activity.

Further, this paper investigates the aggregates of the variables they use. These economic variables are more broad-based, therefore can be efficiently tested for on an aggregate level. In my project, I will incorporate several other variables that will include microeconomic trends like wage and labor statistics. By doing this, I will encapsulate both sides of economic growth, on a

micro level and macro level. It will fill in this gap. This study also includes years 2003 up to 2011 where I will be filling in the years leading up to the most recent statistics, which for most African nations is 2016, therefore updating the significance. This is truly significant because the growth curve for Chinese FDI is exponential and has increased largely in the past 5 years. This update to the literature will allow for a larger portion of the recent data.

There are papers that revolve more around the analytical and explanatory side to explain the motives for why China is investing in Africa. These papers (Adisu and Sharkey, 2010) use non-statistical explanations to illustrate the effects of this investment in Africa and how China is benefitting from it. There are several ideas that include resource grabbing, employment, aid etc. that explain the purpose for Chinese investment within Africa. This paper dives into many different theories and themes related to this issue of “why?” but has issues with coming to their own conclusions. It does a good job at presenting the ideologies, yet doesn’t have any way to affirm or deny them. It is more of a conglomerate of ideas rather than an empirical framework. The overarching theme they cover and discuss are the intentions to gain resources from the African continent. There is a larger, more broad discussion on China’s investment model that talks about Chinese competitive bids towards aid projects that allow the Chinese to maintain some sort of control in the area with resources. They site an example of a offering of \$2 billion in infrastructural aid, thereby outbidding other nations for control of Angola’s Shell Oil Block. It also references other situations of aid within Africa that were seen to go beyond the normal scope of Western investment tactics, therefore illustrating ‘no strings attached’ aid to African infrastructure.

It also discusses the negative potential impacts of Chinese investment in Africa, but doesn’t dive deep enough. They briefly discuss social effects, trade effects, competitive effects, unemployment effects, and moral effects. This paper cites other authors and papers I will conceivably look into when looking at these particular ideologies, but this paper doesn’t do a good job at explaining why these effects are important. The rhetoric from China that they discuss is more of what I’m interested in looking at, and comparing it to that of the statistical data, along with the other moral hazard arguments, is compelling and something I will draw from in my analysis.

I will hopefully be adding much more information and analysis on the reasons for Chinese investment in Africa. Moreover, I will be using statistical analysis to back up such

claims. In doing this, I will be able to focus on particular aspects of Chinese FDI and the effect they may or may not have on Africa's economy, and compare it to deeper issues of this trade partnership to investigate the true purpose of this uptick in investment.

What holds this paper back is the lack of empirical analysis to back up any of its claims. There is an issue of validity when there is no such analysis. The claims of the authors cited in this paper will be useful to dive deeper into the research, yet doesn't pose an actual model to use. It also looks solely at the Chinese-African trade as a macro environment, never diving into country by country. I will attempt to fill in the gap here and ideally compare and contrast the effects of Chinese investment on individual countries. Though this is not my overall thesis, by using statistical tests, I will definitely have this information available. This will broaden my scope to more analysis than this paper digs into.

This paper does a good job overviewing the current picture in the African continent with respect to Chinese investment, yet doesn't have nearly enough analyses to firmly shape my opinions.

Looking more into the specific section of the literature that identifies Africa's relationship between FDI and growth, I zoom in on this area. Adams, 2009 discusses the differences in FDI, domestic investment, and economic growth.

This paper uses a pooled time-series that utilizes many factors of national growth such as government consumption, inflation, political risk, etc.. They find that FDI has a positive and significant effect on economic growth in the OLS method, but not when country-specific effects are controlled for. This is to say that lagged FDI does have a positive correlation on economic growth. They confirmed their hypothesis based on other literature that when country-specific effects are controlled for, FDI lacks in effect. This could be because developing nations (such as sub-saharan African countries) do not have financial systems that are as up-to-date as developed nations, therefore leaving them unable to access the proper channels to funnel FDI into economic growth.

Yet, they find that domestic investment has both positive and significant relationships to economic growth in both fixed effect and OLS, further identifying that this is the best way, on an individual country basis, to help economic growth. They conclude that the relationship between FDI and domestic FDI is a net crowding out effect, which follows logically, and is talked about in several other papers. This will be a key to bring into my paper, given that identifying the

channels in which economic growth formulates from, I will be able to distinguish FDI versus DI. It will be necessary to add this to my model so I have something to compare to. Further, I would like to use their same methodology with the fixed-effects model to control and allow for endogenous, country-specific, factors that contribute to the conclusions I make with my analysis.

This article reiterates that technological transfer through FDI is a key way for the host nation to fully benefit from. While it also argues that in some cases, FDI is seen to be a negative for economic growth in some areas because of the tendency to bring in practices of monopolistic behavior, which is then described as the “underutilization of productive forces.”

He finds a positive relationship on economic growth relating to FDI only in the OLS method of regression. This is consistent with the other literature, for it is difficult to capture various endogenous factors such as pre-conditions that allow for FDI to be taken advantage of. To combat this, I will be including variables that help to define these pre-conditions, and will hope to fully flesh out what creates the susceptibility to FDI.

I will be able to update this information, as it only ends in data from 2003. This is the consistent thread that I see most often in the literature specific to my topic, and one that needs to be improved, so I will be filling in this void in the literature. Also, given that I will be using all African countries, my data should be more robust than most data presented. I am doing a case study on a larger scale, and more pertinent to today’s global issues.

This study doesn’t mention of the endogenous variables I would’ve liked to see. One main one was education level in each nation. This could be a good gage on how progressed the country is educationally, and therefore progressive from a markets perspective as well. This is something I will be taking into account in my model that should hopefully fill in the gap of this strain of literature.

DATA

This section describes the overall dataset and variables I will be using to conduct this experiment, and that is used in the empirical analysis. Because I am testing for the factors of economic growth, specifically related to FDI (China in this case), and technological spillover effect of FDI, my specific variables relate to these particular topics. Though some of the proxies

are difficult to quantify, I have set forth a conclusive set of variables that will be able to illustrate my research question.

I have used all African countries in my dataset, in an attempt to aggregate all of Chinese FDI in Africa. I feel that if I were to take solely the larger recipients of Chinese FDI, my results may become skewed and biased. By including every country, I also get a fuller range of developments between countries. This helps to diversify my data and hopefully provide more significant results. The issue here is that some of the lower income, less-developed African nations don't have all of the consistent data that the higher income countries have. But given the breadth of countries and data points, this should hopefully flesh itself out.

Further, I will be using data from all of Africa's 53 countries, and separating them using a dummy for 'higher income.' I created this variable myself as a proxy for higher income, though they are not considered to be officially higher income by any publication.

My dataset includes years 2001-2016, allowing my range to exceed that of most past literature. My update on the time period will be a healthy filling in the literature involved with this topic. I choose this time period because of the vast amounts of recent FDI from China into Africa. We see an exponential growth in FDI over the course of the past 15 years, presumably because of China's growing wealth based in the technology boom of late. Most of my data has been gathered from The World Bank (2016).

The growth in the Chinese-African trade has expanded mightily over the past 15 years. This illustrates the increase in investment that is the basis for my study. Because I am using the African-Chinese trade, I wanted to use data that felt pertinent in time. The significant increase in Chinese investment in Africa is the impetus to discussing the effect of FDI on economic growth. My paper discusses these theories in economic growth, while testing to see if this particular case study follows the theory or could prove to rewrite the script. Also, by using data from this time period, I use a better-rounded dataset that includes post dot-com boom of the late 90s and early 2000s. This should enhance my results, specifically because I gear them towards these technological spillovers.

In order to measure economic growth, I needed to construct my equation that considers economic growth as its dependent variable. My dependent variable will be percent change in GDP per capita. This variable will be the best way to obtain the proxy for economic growth. This is easily accessible and has been used consistently by the other FDI-growth-relationship

Commented [MD1]: Give details ...
Different how and from which sources?

Commented [MD2]: Just GDP/capita will not measure growth

literature to recreate growth Borensztein et al. (1998). Obtaining these numbers will also be a better distinction within economic growth, illustrating the per capita growth rather than other variables to depict growth. Using per capita makes it easy to compare country by country as well. I will also be scaling my independent variables such as FDI and net trade by dividing them by GDP and will hopefully create a better relationship

My main independent variables will be FDI. I've divided the FDI from China by the GDP of each respective African country in hopes to express the relationship as a share of FDI over GDP. Similar to past literature such as Alfaro (2004) and Hermes and Lensink (2000 and 2003), I will be using FDI from China as my independent variable set up to help determine the relationship between FDI and economic growth. This is normal in the literature and will hopefully give me a better sense to analyze the data. Another standard independent variable used is net trade. This will express and include factors of potentially more open economies, and will act as a simple factor of GDP.

My independent variables, aside from my add-ins to control for normal GDP growth, attempt to explain the necessary pre-conditions related to impacting economic growth. I hope to engage in a theoretical commentary with past literature with this data, given that the capacity for results in spillover effects (especially in technology) has been limited in the past. These variables are mostly common in the literature given that they control for aspects of economic growth theory quite often. Many of them have been used in past literature that use the Solow Growth model as their framework such as Alfaro (2004), Hermes and Lensink (2000 and 2003), and Azman-Saini (2010) who uses a variable that includes a bundle of variables that explain the common aspects of standard economic growth. I feel that by adding proxies to explain economic susceptibility to FDI, I will have added to the past literature. Here I present the variables that I feel best describe economic growth, using this mindset and framework.

Including my variable that measures trade is a direct result from Titus (2011) that discusses trade openness and the relationship between trade and economic growth. They conclude that it is a highly significant factor of economic growth, and therefore should be an essential aspect of my regression analysis. Further, this will help to further draw out all possible aspects of economic growth.

I initially wanted to use an education variable to measure the amount of schooling years after secondary education, which creates a partial proxy for economic efficiency. I propose a

Commented [MD3]: Connect with literature ... it is the most important variable of your model!

connection here between education and labor productivity. Those who have more schooling and education, tend to see increases in value to the labor market based in a higher skill set and in turn productivity. Further, we tend to see this variable used as a proxy for human capital willing and able to be a part of the labor market Alfaro et al. (2004). We see the equation for per capita income above in the literature review, and is used by UI Haque (2016) to illustrate the derivation. However, after further review of the education statistic, I think I capture this aspect of economic efficiency with my phone usage variable. There are many places where higher education doesn't necessarily matter when looking at efficiency and experience in the labor market. For these reasons, the access to cellular phones may be a better determinant for this proxy variable.

I use unemployment rates as an independent variable that will tend to express some of the more country specific issues in the labor market. It will serve as a proxy for labor market health. I will also be using inflation as a more macroeconomic measure of stability (Alfaro, et al., 2004).

I created a dummy variable that measures the top 20 highest GDP per capita measurements on a country basis within Africa. This will help me determine whether or not a country's wealth per capita generates a significant effect in economic growth. The variable will also transform into an interaction variable in a third and fourth model to further illustrate the effect of a high income per capita country.

It is difficult to construct accurate and definitive measures for what I call "FDI susceptibility" other than using proxy variables to distinguish my data. Another proxy for spillover susceptibility is mobile phone usage. This variable is a good proxy for ability to introduce and maintain technological spillovers effective from FDI. This is the variable that will be unique to my project. The actual variable "mobile phone usage" is not something other papers have touched on, but the ability to take advantage of technological spillovers from foreign nations' FDI has been Nobakht et al. (2014). I feel that this variable will be the connecting thread to depict in data the effect of technological spillover. Specifically to my method and analysis, this variable will serve as a proxy for a country's ability to adopt new technologies, which therefore could contribute towards efficiency in the market in terms of labor and capital, and would result in larger economic growth. By including this variable, I am able to link FDI and growth more directly through a channel. It is difficult to run a regression between FDI and growth, especially in developing countries, and definitively conclude that the relationship is positive. There needs to be evidence that that given country has the capability to utilize new

Commented [MD4]: Suggestion: Do you want to start your discussion with this variable, which is a bit removed from the literature?

Start with the ones used by other papers in the literature

technologies, which in turn provide more efficient paths within labor, which **THEN** affects economic growth. So this variable will hopefully give me an understanding of the importance, at least in this case study of the Chinese-African trade, of a country's ability to take full advantage of FDI.

To include for country-specific issues, as well as understand the true relationship between FDI and economic growth, my variables that measure technological spillover will hopefully prove to be the difference maker in my model. Inherently, I will not be able to capture all of the variables pertinent to my research question, and lack of data will create an endogenous bias, but I hope to garner significant enough results to make conclusions. Further, this variable will help to draw out some of the mechanisms of economic growth. Most of the literature uses variables such as education, openness to trade, or market "modernness" as the variable that depicts an individual countries' ability to take advantage and utilize FDI (Titus, 2011). My variable of phone usage, should be a more accurate measure of the precondition of a given country to be able to sustain substantial technological spillovers that can take advantage of FDI. This variable will tend to be somewhat similar to Nobakht (2014) that measures financial development in upper-middle income countries. I hope that my addition with mobile phone usage will help substantially to act in a similar way. By establishing mobile phone usage as a variable that proxies for economic technological susceptibility, I will hopefully be using a more standardized way to test for the preconditions faced in an economy. Hopefully I will see this independent variable do some work in my model and be able to predict more accurately the individual conditions needed to obtain such growth.

METHODOLOGY

This section will show my models and explain the reason for including each one. It will also define my variables. I will be using an OLS regression format for my analysis, breaking it into three distinct models. There's a significance in the literature regarding the estimation method for the description of the models. Most iterations of the literature demonstrate that using OLS estimation doesn't incorporate some factors that account for endogenous issues in the individual countries to determine whether or not this relationship is just causal, or truly significant. The past literature has found a mostly positive relationship between FDI and economic growth when using OLS, yet explain that some of the estimations may not be as

Commented [MD5]: This will not deal with endogeneity .. only, capture some of the mechanisms of FDI influencing growth ...

strongly significant as they intend (Azman-Saini, et al. 2010). I believe that these papers do not take into account fully the factors of growth, especially those that act as pre-conditions to growth, therefore only partly creating the equation that illustrates the relationship. I hope to include as many essential pieces of growth as I can, including some variables that account for the extended growth model, theorized by some, but never really tested for. My shift from the common variables in growth literature should allow my results to maintain consistent and truthful depiction.

Defining my variables

FDI: This variable is foreign direct investment from China divided by the GDP of the country. This is my main action variable that will help to determine the linear relationship between Chinese FDI and African economic growth. It is in U.S. dollars. This variable is used by Borensztein (1998) and paper proceeding it, using it to describe most clearly the relationship between FDI and economic growth. Here I use it specific to China because of my case study.

Unemployment: This is the unemployment rate as a percent. This variable stems from Borensztein (1998) as well, as it is embedded in a basket of descriptive variables regarding the proxy for economic growth.

Phone: This is defined as mobile phone usage per 100 people. In other words, how many mobile phones per 100 people per country. This is my addition to the past literature. Some authors, like Nobakht (2014), use preconditions in a given economy to measure the spillover effect of technology in relation to FDI. I look to proxy for that in a more direct and efficient way with this variable.

CPI: This is measured as the net change in inflation as a percent over a given year.

NT: This stands for net trade. It is divided by the GDP of the country to ensure scalability. Titus (2011) is the reason for this added variable, in order to test and relate the significance of trade on economic growth to FDI's relationship to economic growth.

Commented [MD6]: As you introduce variables to be used in the regression model .. cite sources ...

You can be brief ...

Say something like ..

Along the lines of author (year), FDI measures the amount of FDI from China in \$ (divided by GDP).

Dummy: As explained earlier, this variable lists the top 20 GDP per capita nations in Africa, and assigns a “1” to them. All other entries have a zero. In models 2 and 3 I will be utilizing two different interaction variables, both involving the Dummy. In model 2, I will be using the dummy and FDI as my interaction variable. While in model 3, I will be using Dummy and Phone. This variable is represented in the literature more so in the form of pre-sorting the various economies in order to test for a specific economies. Particularly in Nobakht (2014), this paper uses the idea of UMCs as their case study. By including this dummy I hope to take out some of the disparities in the range of economic conditions represented in the African continent.

Model 1:

$$GDP_{it} = \beta_0 + \beta_1 FDI_{it} + \beta_2 Phone_{it} + \beta_3 CPI_{it} + \beta_4 Unemployment_{it} + \beta_5 NT_{it} + \beta_6 Dummy_{it} + \Upsilon_t + e_i$$

This model is my linear regression model. This will be testing the real dollar effect on economic growth based on my independent variables.

Model 2:

$$GDP_{it} = \beta_0 + \beta_1 FDI_{it} + \beta_2 Phone_{it} + \beta_3 CPI_{it} + \beta_4 Unemployment_{it} + \beta_5 NT_{it} + \beta_6 CPIA + \beta_7 Dummy_{it} + \beta_8 (Dummy_{it} * FDI_{it}) + \Upsilon_t + e_i$$

This model will introduce my interaction variable to help further specify the effect of Chinese FDI. By combining the dummy and FDI, I am seeing what the relationship between FDI and GDP is based on whether or not the country is high income or not. That being said, Chinese investment takes on different forms in Africa. But, this model will allow me to see the closer relationship between FDI and growth. It further specifies that relationship.

Model 3:

$$GDP_{it} = \beta_0 + \beta_1 FDI_{it} + \beta_2 Phone_{it} + \beta_3 CPI_{it} + \beta_4 Unemployment_{it} + \beta_5 NT_{it} + \beta_6 Dummy_{it} + \beta_7 (Dummy_{it} * Phone_{it}) + \Upsilon_t + e_i$$

Similar to the above model, I will use this interaction variable to identify the particular effect of mobile phone usage based on whether or not the country is relatively high income or

not. This model will test the closer relationship between Phone and economic growth because of its interaction with the high-income dummy.

I have some predictions for expected signs within my model. I expect to see positive results for the FDI, Phone, CPI, NT, and Dummy variables, while seeing a negative sign for the Unemployment variable. This follows the literature that includes aspects of my research in the relationship between FDI and economic growth. I generate these predictions based on Borensztein (1998), Alfaro (2004), Azman-Saini (2010), and Doku (2017). They find similarly positive coefficients when stacking similar variables against economic growth, though most of their coefficients are not significant. Azman Saini (2010) identifies that OLS estimation method perhaps is the reason for the insignificant positive relationship between FDI and economic growth. They explain that using OLS estimation may not be the best model to identify this relationship because it is fixed in liner modeling, rather than taking into account that certain threshold that distinguishes when an economy is ready to take on economic growth from foreign investment. I hope that my model will help to illustrate this threshold by illustrating the significance of technological advancement in a given economy.

ROBUSTNESS CHECKS

This section will discuss my robustness check measure I took on. I performed a Hausman test on all three models. The results of this test can be seen in Table 1. I reject the null hypothesis given that my p-values in each test are over the .05 limit. This means that I used the random effects model in my regression analysis.

Table 2 expresses my test for multicollinearity. I found my VIFs to be all under 5, therefore rejecting any sense of multicollinearity in my model.

Hausman Test

Model	Chi2 value	P-value
1	4.25	.51
2	4.98	.55
3	4.08	.67

Table 1.

Linear VIF statistics

Variable	VIF	1/VIF
Dummy	1.41	.709
NT	1.24	.805
Unemployment	1.20	.832
FDI	1.10	.906
Phone	1.08	.923
CPI	1.04	.965

Table 2.

RESULTS

This section will dive into my results of my statistical analysis. As shown in Table 3, I don't have particularly significant results. That being said, I got mostly expected signs and some significance. These results are shown below.

VARIABLES	(1) GDP	(2) GDP	(3) GDP
FDI	-1.914 (4.248)	-2.095 (4.219)	-2.061 (4.225)
Unemployment	0.160 (0.112)	0.160 (0.112)	0.158 (0.112)
Phone	-0.0742*** (0.0206)	-0.0755*** (0.0203)	-0.0627** (0.0289)
CPI	-0.0431 (0.0410)	-0.0433 (0.0409)	-0.0392 (0.0415)
NT	14.26** (6.340)	14.27** (6.328)	13.68** (6.408)
Dummy	-1.648 (2.028)	-1.741 (2.013)	-0.0998 (3.315)
DummyFDIint	-16.10 (38.29)		

Commented [MD7]: The dependent variables can be average per capita GDP growth or annual per capita GDP growth or ln(GDP/capita)

DummyPhoneint			-0.0255 (0.0409)
Constant	11.78*** (2.160)	11.85*** (2.149)	11.09*** (2.474)
Observations	230	230	230
Number of country1	44	44	44

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3.

Model	Within	Between	Overall
1	9.38%	7.13%	9.68%
2	9.23%	7.65%	9.75%
3	9.46%	6.39%	9.84%

Table 4.

My r-squared values are presented above in table 4. Obviously, these r-squared values are very low. It doesn't necessarily mean that my data is flawed in any way, though a low r-squared coupled with a significant constant in all three models could signify some variables that are missing from my model. Potentially, given how small the numbers are, a couple are key variables that describe economic growth. But, given the breadth of my data set and the missing variables, this r-squared is not too insignificant. A way to fix this would be to add more variables.

In model one, we see a negative, insignificant coefficient for my FDI variable. Though the number is insignificant, I am able to take away some results. Firstly, the negative relationship is definitely quizzical. These results go against Doku (2017) and their argument for a positive relationship in economic growth in Africa from Chinese FDI. This is an interesting take away from the data. It could be this way because of the countries I used in my model versus their model, which looked primarily at Sub-Saharan Africa. It goes against my initial predictions on sign, though at such an insignificant level (with p values in the 90th percentile), I am able to conclude that I do not have sufficient evidence to support my claim that FDI effects growth.

My net trade variable has some significance at 5% in each of my three models. Also, the coefficient is positive in each model. This means that an increase in net trade equates to between a 13% and 15% increase in GDP per capita. This is something I didn't think would garner significant enough results to comment on. Yet, in my regression, I'm able to take away a lot from this variable. It illustrates the importance of trade within economies in Africa. Titus (2011) talks about the importance of trade openness for economic growth. Though this wasn't the center of my thesis, I find similar results to Titus (2011) that net trade has a large positive significance on economic growth. In keeping with my theme, I can conclude that trade has a larger effect on economic growth than FDI.

However, in all three models, the coefficient for Phone is significant. This meaning is twofold. For example in model 1, a one phone increase per 100 people, creates a 1.91% decrease in economic growth. This number is significant at the 1% level in two of three models, and at 5% in model 3. This result is both positive and negative for this research. Being significantly negative, that goes against my initial hypothesis. Though, at the same time, it is an interesting take away that mobile phone usage seems to have a negative relationship with economic growth. Indirectly, this disproves the test made by Nobakht (2014) and claims from earlier literature, such as Alfaro (2004). Both of these paper to some extent attempt to explain what preconditions are necessary to take advantage of foreign investment, and were helpful predecessors to my research. What this tells me is that the technological susceptibility, which I've assumed as a proxy in the Phone variable, is an important and significant factor in economic growth, though not as initially thought to be a positive relationship. This addition is very significant, as others have tried to find a way to test for a country's openness and ability to take advantage of FDI. Though now I am able to conclude to some extent that these preconditions of technology are somewhat insignificant when relating it to FDI and economic growth. It's an important distinction that it is a negative relationship because we can propose new hypotheses as to why we may see this relationship. It could illustrate that as the world has become more and more globally technologically advanced, each additional increase in technology actually stunts susceptibility of taking advantage of FDI.

The variables I was most interested in the second and third models were my interaction variables. In model 2, the interaction variable between FDI and my dummy variable had a negative relationship with economic growth. Again, Nobakht (2014) and Doku (2017) relate to

Commented [MD8]: Connect this finding to results of other papers in the literature ...

these results. They conclude that FDI does affect economic growth, in a case study solely in Sub-Saharan Africa and UMCs. In my study, I attempt to make a distinction between higher and lower income countries, yet by using a synthetically produced dummy variable. The results are pretty tame in my model, though insignificant. Because they are relatively insignificant coefficients in terms of magnitude, I can't truly say whether or not the wealth level of an economy relates to its ability to accept and utilize foreign investment. But, according to my results, technically this signifies that if the country has a proportionately wealthier economic infrastructure, FDI slows down growth. Essentially, it means that already more established nations in Africa may not need the foreign investment resources as their lower-income counterparts, which disagrees with the conclusions of Nobakht (2014). It could further conclude that these higher-income countries may need other kinds of economic support to increase economic growth. It could also illustrate that the relationship between China and these countries is more beneficial for China, in that if these countries are taking in large amount of foreign investment, and lessening in wealth, there's a sense that China could be taking advantage of those nations instead of helping them.

Commented [MD9]: Are the estimates significant?

In model 3, I use the interaction variable between Phone and Dummy. This relationship is also negative. This could be a similar rationale as model 2 and the negative coefficient. What we can take away here is that mobile phone usage may have a positive slope at a decreasing rate. In other words, a diminishing marginal return schedule per phone increase. As the country becomes wealthier and wealthier, the effect of adding one more phone per 100 people becomes less and less, therefore lowering the effective rate at which it can effect economic growth. Because both individual independent variable (Dummy and Phone) both maintain positive signs, it is a bit curious regarding the interaction between them. The coefficient is insignificant, yet it allows us to dive into why the interaction between the two variables creates negative growth.

Commented [MD10]: Is it significant?

The final thing to look at are my constants. They are all significant, which I'll discuss the drawbacks of in my next section. This usually means that I've lost some explanation of my dependent variable by not including every variable that describes the dependent.

These results can open our eyes as to why economists hypothesize the positive relationship between FDI and economic. There are significant takeaways that can affect policies and economic structures within these countries. I will discuss those more in the next section.

DRAWBACKS TO MY STUDY

This section will outline some of the drawbacks of my study. It will discuss the issues in my data, and issues I found with my methodology that could have been improved. Further, I will discuss some of the limitations based on my study. One of the main limitations is the lack of data in some underdeveloped countries. This creates bias towards countries that do have data, and have the potential to skew the results in their favor, measuring more of the developed countries than the aggregate.

There are most likely some omitted variable bias given that I find some unpredicted signs. Some of these factors would include variables I did not test for, such as trade openness and trade laws.

Another critical drawback to my study are the factors of endogeneity created by Chinese investment. I wasn't able to quantify where Chinese investments flow, and therefore was unable to test aspects of the effect China has on growth in these nations. To do this fully, one would need to identify and quantify where the Chinese investments are going, and analyze via a dummy on this stage. Something referring to the top countries China invests in could act as a dummy in a new model. And therefore, the opportunity to include a variety of different interaction variables would be inherent. That being said, Chinese investment takes on different forms in Africa. There are sources of foreign aid, infrastructure, and resource grabbing that China is interested in. This scatters the investments, and not necessarily based on Africa's top 20 GDP per capita. If I could conclusively say that Chinese corporations that have made their way to Africa are part of the reason for increased economic growth, then my dummy statistic would be more valid. This is a difficult distinction to make, however.

One other drawback is that my hypothesis that FDI has an effect on economic growth, through channels of technological advancement and susceptibility to changing condition, is tested on a continent level. There are various types of laws and financial systems spanning the continent of Africa, so the study perhaps lends itself closer to a **microeconomic** ideology. I try to capture some of that through my variable CPIA, but it's impossible to totally tell unless I were to do a country by country analysis. Though my study can be scaled and utilized for local economies, there are systems locally that I simply cannot express when using such a large sample size.

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Another drawback to my study is the omitted statistics on some of the nations. Some of the lower-income nations in Africa have not had success since the past few years of keeping these macroeconomic statistic accessible. Therefore, I may tend to see some inconsistencies in the significance of my data. Further, the dummy variable I created for this study may not be the most accurate way to illustrate higher versus lower income nations within Africa. There wasn't much by way of research done on the whole of Africa, so there wasn't information on how people, if at all, broke up the countries by wealth. I thought it was a good way to differentiate the income levels in my study, though I also realize that solely looking at GDP per capita may not be the best measure of a country's wealth.

My variable of mobile phone usage will also not take care of any endogenous issues in my model. It only serves as a determinant of economic growth, explaining some of the mechanisms that go into individual country-specific economic growth. I struggled to find a way to account for endogeneity issues in my model because I used such a large sample size and such a range of different economies. By using my dummy variable, I attempted to separate out the economies by level of wealth, hoping to fulfill some of these endogeneity issues that may result from very large differences in economic health. But, after looking at the data, there isn't enough to conclude that it made a large difference. So in further research I will have to account for these issues.

POLICY IMPLICATIONS AND DISCUSSION

There are several implications from this research from a policy perspective. I sought out to determine the relationship between FDI and economic growth, yet in the context of the Chinese-African trade relationship. From my findings, I am able to touch on essentially three aspects of this relationship.

The first is regarding FDI. Given that my results were insignificant and opposite signs than I expected, there isn't anything conclusive that I can say from either the Chinese or African perspective on whether or not the exponential increase in investment is good or bad. Therefore, from a policy perspective, we will have to see how this relationship plays out in the future, in order to determine the right path to move towards policy-wise. If the relationship is negative, I would suggest that Africa be more selective in the ways they allow Chinese companies and investment to flow into their nations.

Another thing to tough upon is the technological advancement. According to my study, we see that advancement in technology (or at least my proxy for technological advancement) negatively influences economic growth from a foreign investment standpoint. This defiance of older literature (Azman-Saini, 2010 and Alfaro, 2004) is rooted in the technological preconditions that were supposed to be most important for economic growth. Yet, my research tends to lean towards the conclusion that there are other, more important ways for a nation to take advantage of FDI. From a policy perspective, local markets and governments will have to decipher that best ways for them to grow from foreign investment. One of these other ways may be to only accept foreign aid as FDI, and not allow foreign economies to influence infrastructural changes that set up property, plant, and equipment in a given economic structure in these individual nations.

Another aspect that I touched upon in my introduction was the "investability" of these economies. By the results I've found, I can suggest that understanding an economies' trade structure and trends could be a good way to predict its future economic growth, and therefore to some extent predict the "investability" of a given nation. This is by no means the most efficient way of researching investment opportunities, but it could aid in giving a general overview of those individual countries' growth potential.

Finally, there are significant policy implications as they relate to trade policies. Because of the significance I found in the coefficients for my net trade variable, this should signify the importance of trade for economic growth. Ricardo (1817) suggests that the way to increase economic growth is by international trade, even if you produce goods more efficiently than your trade partner. I find similar results to Ricardo's theories surrounding trade. These conclusions could be significant when looking at foreign and international trade policy in African nations. From my data, it suggests that an open trade policy, and a continuing increase in trade, may be the most efficient way to increase economic growth.

FURTHER RESEARCH

An important piece to my literature is where it can go from here. With the scope of my thesis, I was not able to touch upon everything involved in the Chinese-African trade relationship. Several aspects of this relationship bring about the question of "why?" Why China has taken such an interest in Africa's economies is a topic that has not be researched in a formal

matter. I touched upon some of these issues in the introduction briefly, but there is far more that can be explored there. It was somewhat unattainable in my research given that most of the thoughts are theoretical and unable to test statistically.

Another idea that could be pursued further is looking into the effects on the Chinese economy. Whether looking for the effect on economic growth within China, or understanding where and how the money is funded, there are different directions to take it.

Finally, another direction to take research in this genre is attempting to utilize a different format rather than the Solow framework. Though this is consistently the most used framework in this vein of literature, there may be other ways to capture economic growth. In this line of thinking, perhaps using a less standard way of measurement could shed light on the reasons for such insignificant results as well. Given the lack of data in some places, I can imagine that there were definitely some areas where that could've improved.

Finally, using different case studies could be an interesting way to understand more about the relationship. By using strictly Africa, I looked into mostly underdeveloped nations economically. Therefore, I definitely in the future could look at a larger variety of economic conditions, or different geographical areas of the globe. In this trade relationship, there are obviously several exogenous factors that are at play here, which could skew my numbers a bit, and could be the reason why it was difficult to obtain significant results.

Works Cited

- Adisu, K., Sharkey, T., Okoroafo, S. (2010). The Impact of Chinese Investment in Africa. *International Journal of Business and Management*. Vol 5, No. 9.
- Alfaro, L., Chanda, A., Kalemli-Ozcan, S., Sayek, S. (2004). FDI and economic growth: the role of local financial markets. *Journal of International Economics*. 89-112.
- Azman-Saini, W.N.W., Hook L., Siong, Halim Ahmad, A. (2010). FDI and economic growth: New evidence on the role of financial markets. *Economic letters*, 211-213.
- Borensztein, E., De Gregorio, J., Lee, J-W. (1998). How does foreign direct investment affect economic growth?. *Journal of International Economics*. 115-135.
- Doku I., Akuma J., Owusu-Afriyie J. (2017). Effect of Chinese Foreign Direct Investment on Economic Growth in Africa. *Journal Of Chinese Economic And Foreign Trade Studies*. 10(2):162-171.
- Haydaroglu, C. (2015). The Relationship Between Property Rights and Economic Growth: An Analysis of OECD and EU Countries. *Law and Economics Review*. 6 (4), 217-239.
- Hermes, Niels, Lensink, Robert. (2000). Financial system development in transition economies. *Journal of Banking & Finance*. 507-524.
- Hermes, Niels, Lensink, Robert. (2003). Foreign direct investment, financial development and economic growth. *Journal of Development Studies*. Vol 40, 142-163.
- Mahya Nobakht, Seyedashkan Madani. (2014). Is FDI Spillover Conditioned on Financial Development and Trade Liberalization: Evidence from UMCs. *Journal of Business and Management Sciences*. 2(2):26-34.
- Ricardo, David. (1817). *On the Principles of Political Economy and Taxation*. Published 2004. 77-93.

Titus O. Awokuse (2011) Trade openness and economic growth: is growth export-led or import-led?, *Applied Economics*, 40:2, 161-173,

ul Haque, I. (2016). The Productivity Growth-Technology-Entrepreneurship Nexus: Implications for Pakistan. *Lahore Journal Of Economics*, 2115-31.

Wu, G., Sun, Y., & Li, Z. (2010). The Crowding-In and Crowding-Out Effects of FDI on Domestic Investment in the Yangtze Delta Region. *Transnational Corporations Review*, 2(4), 59-75.