An Empirical Examination of the Effect of Corruption on Health Outcomes

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Abstract

Corruption in health care is an often overlooked factor affecting health outcomes in a country. Previous research has shown that there are various outlets for health care corruption and that corruption lowers the quality and quantity of health care services. Based on panel data estimation of 30 countries from 1996-2011, this paper demonstrates that corruption in health care has detrimental effects on health outcomes, including a lower life expectancy (at birth) and higher infant mortality rate (per 1000 live births). Corruption has a bigger impact on health outcomes in poorer, developing nations than in richer, developed nations. Good governance practices and a larger urban population are shown to improve health outcomes in a country. Transparency in all facets of health care is crucial to reducing corruption and improving health outcomes.

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I. Introduction

Corruption varies in its form and is pervasive in its effect. Corruption in healthcare is often overlooked even though it may have a substantial impact on health outcomes in a country. Health outcomes serve as an important measure of the overall well-being of a nation, so it is essential to consider all factors, such as corruption, that may affect health outcomes. A study on corruption in healthcare is a unique approach to both corruption and healthcare. A majority of studies on corruption focus on politics and government and do not explore how corruption affects a major sector like healthcare. In the same way, much research has been done on the economic aspects of healthcare, but there is very little focus on how corruption plays a role too. Simply put, there are few existing papers about corruption in healthcare and its ripple effects and I hope my research can provide valuable insights for that important field of study.

My research question is: What effect does corruption in health care have on health outcomes? I believe corruption causes health care to be both inefficient and unreliable. As a result, the effectiveness of health care declines and health outcomes suffer. I hypothesize that corruption has a negative impact on the health outcomes of a country.

The paper will analyze data from 30 countries over a 16 year period in panel data estimation that combines time-series and cross-country analyses. Health outcomes will be measured using two reliable and widely available measurements, life expectancy and infant mortality rate. There will be two variables to measure corruption: ICRG's corruption level and Transparency International's corruption perceptions index. In addition to corruption, I will incorporate the independent variables of Real GDP/capita (current USD), government stability, law and order, democratic accountability, and urban population into the regression. The

coefficients of the independent variables will be analyzed in order to interpret a relationship between the independent variables and health outcomes.

My end goal is to offer helpful information and important policy recommendations to both economists and healthcare officials who want to rid health care of corruption and make it more efficient and reliable. I hope my research and policy recommendations lead to tangible reforms in healthcare that make it more transparent and corruption-free, and, in turn, result in improved health outcomes for a country.

II. Literature Review

In order to develop an accurate and effective model, a combination of two things must be done. First, a large number of data needs to be utilized in the model. Second, the model must have measurements that best encompass the variables in the equation. There were a multitude of health measurements that were considered to represent health outcomes, ranging from life expectancy to infant mortality rate to disability adjusted life expectancy (DALE). Ultimately, life expectancy and infant mortality rate were chosen to be a part of the model not because they were the absolute best measurements but rather because they were unequivocally the most widely available data measurements. Disability adjusted life expectancy is a "more comprehensive measure of population health" that is "sensitive to changes of health in the whole population" and "accounts for the morbidity associated with non-fatal health outcomes as well as mortality" (Reidpath 2003). However, since DALE is a more complex measurement, many poor countries do not have the resources to gather enough data to make such measurements possible. As a result, the DALE measurement is limited to richer countries and would lead to many countries

being left out of the model. In order to include more countries into the model, infant mortality rate was used to encompass health outcomes because it "remains a useful and comparatively inexpensive indicator of population health" (Reidpath 2003). Likewise, life expectancy was used because it is widely available and it is a dependable measure of population health. Life expectancy and infant mortality rate offered the best balance of reliability in reflecting health outcomes and availability in finding the measurements for many countries over many years.

The World Health Organization (WHO) regional office in Europe divides corruption into four types: bribery, theft, bureaucratic or political corruption, and misinformation for private gain. Tim Ensor and Antonio Duran-Moreno (2002) highlight that corruption in healthcare increases inequality and affects the poorest and most vulnerable population groups the most. Also, corruption is more likely to occur in low and middle income countries, which further detriments the poor. Moreover, corruption usually spills over from the public sector to the private. Private companies are more likely to exploit public facilities and continue corrupt practices rather than set up their own private clinics. As a result, corruption slows down economic growth and reduces private sector investments, which negatively affect the macro-economy of a country. The WHO calls for increased transparency and more strict and clear anti-corruption laws. Corrupt people need to be prosecuted and put away according to the law. There needs to be a system in place that is easy and efficient for patients to complain against corruption. The system needs to be equal and open to everyone, the rich and especially the poor. The WHO calls on a widespread team effort from government officials to medical providers to international NGOs in order to combat corruption in healthcare.

Sangeev Gupta, Hamid Davoodi, and Erwin Tiongson (2000) focus on how corruption affects health care and education services. I particularly focused on reviewing their findings on

health care because it is more relevant to my topic. The paper suggests that government intervention in the health care market makes the health care system susceptible to corruption and other inefficiencies. Corruption is categorized into primarily two forms. The first form is "corruption without theft". In this case, a medical provider charges the government established price plus a bribe for a particular medical service. The provider keeps the bribe and gives the government charged amount to the treasury. The bribe raises the cost of the medical service, and, in turn, lowers the output. The second form of corruption is "corruption with theft". In this method, the provider collects the government imposed charge for the service, but does not give it to the treasury but keeps the full amount for himself. In this way, the provider can lower the cost of the service because the provider is keeping all the money. The lower price is also attractive to the consumer because they are now paying less for the service. Since this form of corruption is mutually beneficial, it is much more difficult to detect. However, this form of corruption may reduce the quality and efficiency of medical services. Thus, "corruption without theft" reduces the quantity of medical services and "corruption with theft" lessens the quality of medical services.

The paper also emphasizes that corruption in health care has a dual effect: quantity is lowered and quality is reduced. As a result, health outcomes such as child mortality rates, infant mortality rates, and percent of low birth weight babies are adversely affected. The paper also gives some policy recommendations in order to fix the problem of corruption in health care. The healthcare system needs to be made more transparent and there needs to be more financial accountability on public spending on healthcare. Additionally, private sector entry into healthcare is encouraged because it would prevent the government from having a monopoly on healthcare. Without a healthcare monopoly, it would be much harder for government officials to

charge a bribe for services. Reforms need to be made that reduce both types of corruption in healthcare so that health outcomes are not negatively impacted.

Subrata Chattopadhyay (2013) focuses on the effects of different forms of corruption in the healthcare sector and provides several recommendations to tackle the issue. The purpose of the article is to shed light on the issue of corruption in healthcare and incite a public discussion that will lead to meaningful reforms. Corruption has a pervasive effect in three large areas of the healthcare field: patient care, medical research, and medical education.

Patient care is perhaps the largest area where corruption occurs in various ways. Patient care entails the construction of healthcare facilities, access to hospitals and other care, and the monitoring and regulation of products and services. In the construction of healthcare facilities, bribes may be made in order to acquire the contract to build the facility instead of choosing the most qualified construction company. Once the contract is acquired using a bribe, the construction company does low quality work and the facility is sub-par in meeting many medical needs and standards. Additionally, patients can make bribes and other informal payments to gain better access to health care. This leads to health inequity and perpetuates a lack of access to medical care for poorer patients. Bribes or political allegiances are also made to the government agency in charge of inspecting and regulating the quality of drugs and medical services. Consequently, the quality of drugs and medical services deteriorates without proper regulation, and a patient's health suffers due to inadequate medicine and services.

Medical research is also plagued with corruption. Medical journals may be paid bribes that publish papers and articles that are illegitimate or poorly conducted. This leads to false knowledge being spread throughout the medical community. Also, poor and uneducated people

are exploited for clinical trials. It is unethical for participants to not be compensated if the trial leads to injury or death. This creates mistrust between health care providers and the public.

Corruption in medical education has serious long term effects as well. Bribes, nepotism, and political influence are all used to gain entry into a medical college or pass an important exam. As a result, the most qualified, talented, and skillful individuals are limited from becoming physicians and having the opportunity to deliver high quality of care. Instead, potentially inept and less qualified individuals who bribed their way into the medical field are now delivering inadequate and ineffectual care to patients.

Chattopadhyay (2013) calls for a strong and unified support for anti-corruption measures. Patient groups, health organizations, NGOs, governmental agencies, the media, and the general public must all unite to take a definitive stand against corruption in healthcare. Whistle-blowers must also be protected and incentivized to expose and report on corruption practices. A transparent and impartial agency must have effective resources and powers to monitor, regulate, and penalize corruption. Health outcomes can't continue to suffer from corruption.

Anita Jain, Samiran Nundy, and Kamran Abbasi (2014) demand doctors to fight kickbacks and other forms of corruption. Corruption in healthcare is so pervasive that "best estimates are that between 10% and 25% of global spend on public procurement of health is lost through corruption" (Jain, Nundy, & Abbasi, 2014). This is an immense amount of money that would better be used on health treatment to those that need it. Corruption is so pervasive and difficult to tackle particularly in healthcare for several reasons. First, doctors are in a position of power that has little oversight, which makes it easy to abuse power. Second, doctors may have financial pressure to be corrupt since it is so easy and directly beneficial to them. Finally, a culture of corruption has been solidified over many years of failing to address and tackle it. As a

result, doctors may believe being corrupt is permissible because it is part of the culture. However, measures must be taken to eradicate the culture of corruption in medicine. Good governance needs to be emphasized, healthcare must become more transparent, and there must be an unequivocal zero tolerance for corruption.

In the European Commission's (EC) healthcare corruption study, researchers utilized "desk research, interviews (with EC officials and representatives of health professionals' organizations, medical device industry, pharmaceutical industry and health insurers) and field research" (EC 2015) from the 28 EU member states. They found six types of corruption that occurred most frequently in healthcare: bribes in delivery of care, bribes in obtaining medical supplies, unethical marketing relations, abuse of power positions, excessive reimbursement claims, and embezzlement of funds and supplies. The most common occurrence of corruption was bribes given by patients to doctors in the delivery of health care services. The paper gave several unique recommendations on how transparency can specifically reduce corruption. Waiting lists with queuing times should be made public, so that there is not inequity in care. This will prevent doctors from accepting bribes from patients that want better or faster care. Additionally, there needs to be more transparency between the industry and healthcare providers. Corruption often sprouts from extra close ties and quid pro quo measures from these two entities. Requiring physicians to "prescribe generic instead of brand medicine is another good transparency enhancing policy" (EC 2015) because it reduces ties between physicians and industry. Finally, the study found that anti-corruption measures must be tailored for the country it targets to be most effective.

Owen Dyer (2006) brings up the point that corruption in health care is especially difficult to measure and quantify because it happens in so many different ways. For example, a physician

that conducts unnecessary procedures just to increase the patient's bill can be considered corrupt. However, the unnecessary procedures can also be attributed to an honest mistake made by the physician. Even though it is difficult to measure corruption, it is well known that "the world's health systems are vulnerable to corruption in every country and at every level from central government to patients themselves" (Dyer 2006). In some countries, health care workers are paid so low that they must resort to corruption in order to make a living. This type of systematic corruption is very difficult to fix and change. The article calls for a larger portion of health budgets to be used towards monitoring and auditing health care systems for corrupt practices. This is a smart investment to make because preventing corruption would help save public money and improve health outcomes.

Omar Afzar and Tugrul Gurgur (2005) utilized eight different surveys to gather data to capture and quantify the various forms of corruption. Different forms of corruption can have different economic effects. For example, the cost of health care increases if a bribe is demanded by the provider on top of the official payment. This would reduce demand for health services and worsen health outcomes. However, there is a different economic effect if the form of corruption is that the provider pockets the money intended to be the official payment. The economic effect is that "this reduces government resources allocated to service delivery, which would also worsen outcomes" (Afzar & Gurgur, 2005). Although different forms of corruption have different economic effects, they all negatively impact health outcomes. In fact, the paper found that "the corruption variable remains the single most important factor that influences health outcomes in a consistent basis" (Afzar & Gurgur, 2005). The paper provided convincing evidence that corruption influences the delivery of health services and negatively affects health outcomes.

Tim K. Mackey and Bryan A. Liang (2012) argue that corruption in health care affects developed as well as underdeveloped countries and the public and private sectors of the field. Since "current domestic and sectorial-level responses are fragmented and have been criticized as ineffective", it is crucial to have a global health governance framework put in place (Mackey & Liang, 2012). A global framework would combat corruption by setting unified standards, laws, and regulations against corruption. The international community as a whole would have more resources and manpower to multilaterally act against corruption. It is vital to act swiftly because "health corruption not only leads to financial waste of scarce resources, but also has adverse impact on healthcare access, infrastructures, financing, and social determinants of health" (Mackey & Liang, 2012). A global health governance framework needs to quickly and effectively be implemented in order to stop corruption.

Maureen Lewis (2006) highlights the inefficiencies in health care created by corruption and bad governance practices. "Returns to investments in health are low where governance issues are not addressed" (Lewis 2006) because money is lost in leakage created by ineffective governance and corruption. In the paper's model, health outcomes are determined by labor, capital, and governance. An increase in labor and capital both improve health outcomes. However, governance can either improve or detriment health outcomes. Good governance is reflected in having sound and well-established institutions. The institutions are able to effectively and efficiently monitor and control corruption. If corruption persists and there is ineffective governance, "health workers are absent, patients pay illegal fees, and basic inputs are stolen without any consequences for those who mismanage or corrupt the system, performance of health services will be poor and population health will suffer" (Lewis 2006). Good governance is

essential towards ensuring that public funds spent towards health care are effective in increasing health outcomes.

Taryn Vian (2007) states that corruption is a widespread problem that negatively impacts health status. The policy recommendations are similar to the ones mentioned previously in the literature review, including more transparency, stronger anti-corruption measures, and harsher penalties for violators. The article provides good insight on the data collection and analysis side of determining the effect of corruption on health outcomes. Since corruption is often hidden, it is very difficult to directly measure. In order to compensate, there are four different approaches to estimating a measurement for corruption. Corruption perception surveys are one approach, and it is utilized by the reputable organization Transparency International. Citizens in general are surveyed on their perception of corruption. However, a flaw in this approach is that actual corruption behavior may vary from perceived corruption behavior. Another approach is public expenditure surveys and data analysis. A review of public expenditure can identify leakages in public funds and money that is unaccounted for in public spending. A third approach is qualitative data collection, which focuses on in-depth interviews to gather information. This approach allows the researcher to gather ample information on beliefs and attitudes towards corruption. However, the inherent bias of the interviewees may affect the results. A final approach is control systems review, which analyzes existing administrative systems against corruption. A flaw is that these systems may not even be present in developing nations who have unstable and ineffective institutions. The paper emphasizes that it is very important to estimate corruption using a country specific approach in order to get the most accurate results in an analysis.

III. Data and Methods

The final model was a panel estimation, which combined time-series and cross-country observations in order to estimate the effect of corruption on health outcomes. Panel estimation is a good model because it can incorporate many countries over a large period of time in order to get the best possible statistical results. A total of 30 countries were used in the analysis. 15 of the countries were OECD countries and the other 15 were Non-OECD countries. Data was gathered from the years 1996-2011 for all the countries and variables. With a 30 country cross-section observation and a 16 year time period, there were a total of 480 observations in the panel estimation for each of the variables. Panel estimation was used in order to yield more accurate results on how corruption affects health outcomes in various countries and how things have changed over time. Additionally, panel estimation was run separately on 15 OECD countries and 15 Non-OECD countries. We wanted to see if there was a difference in how corruption affects health outcomes between the relatively rich and developed OECD countries and the poor and developing Non-OECD countries.

The dependent variables are life expectancy (at birth) (Y_{t1}) and infant mortality rate (per 1000 live births) (Y_{t2}). Life expectancy at birth indicates the number of years an infant is expected to live if the current mortality rates were to persist. Infant mortality rate indicates the number of infant deaths for every 1000 live births. Both of these dependent variables are perhaps the most accurate indicators of the level of health and well-being in a nation. Thus, I have chosen these two variables to estimate health outcomes in a country. The data was acquired from The World Bank dataset.

The independent variables are Real GDP per capita in current USD (x_{t1}), government stability (x_{t2}), corruption (x_{t3}), law and order (x_{t4}), democratic accountability (x_{t5}), urban population (x_{t6}), and corruption perceptions index (CPI) (x_{t7}). Real GDP/capita was measured in current USD in order to keep the data consistent and comparable among different countries and different years. Government stability was measured from 0 to 12 points, and a score of 12 indicates a strong and stable government, whereas a score of 0 indicates a very weak and unstable government. Government stability was broken down into 3 components: government unity, legislative strength, and popular support. Each of these components was scored from 0 to 4 points, and government stability was the sum of these 3 scores. Corruption was measured from 0 to 6 points, with more points indicating less corruption in the country. The measurement encompasses forms of corruption ranging from bribes to excessive patronage to job reservations. Law and order was measured from 0 to 6 points, with more points indicating an unbiased legal system and more public adherence to laws. Democratic accountability was scored from 0 to 6 points, with more points meaning the government is more responsive and open to the people. For example, democratic governments would be scored much higher than autocratic governments. Urban population is the percentage of a country's population that lives in urban areas. Finally, the corruption perceptions index (CPI) measures the perceived levels of corruption in a country. Each country is scored from 0 to 10 points, where 0 points means the country is highly corrupt and 10 means it is very clean of corruption.

Real GDP/capita (current USD) and urban population measurements were obtained from The World Bank dataset. Government stability, corruption, law and order, and democratic accountability were obtained from the International Country Risk Guide (ICRG) dataset. The corruption perceptions index (CPI) was obtained from Transparency International, a very

reputable source on estimating corruption. Corruption measurements were used from two different sources in order to get a more accurate analysis on how it affects health outcomes. Since there is no available data on specifically healthcare corruption, this paper utilizes data of overall corruption in a country. Corruption spreads into all public sectors, including healthcare. Thus, it is appropriate to assume that an overall corrupt country will also have higher levels of corruption specifically in healthcare. Since corruption is something that is nearly impossible to directly measure, I have used corruption estimates from two different organizations to get better statistical results.

There will be two structural equations in my estimation, with life expectancy being the dependent variable in the first equation and infant mortality rate being the dependent variable for the second equation. For both equations, the independent variables will be the same. A higher life expectancy means a country is overall healthier and better off. Contrastingly, a high infant mortality means the health outcomes in a country are poor. Since life expectancy and infant mortality rate have an inverse relationship, a country with positive health outcomes will have high life expectancy and a low infant mortality rate. As a result, I anticipate the relationship between the dependent and independent variables and their signs to be opposite in sign. For example, if an independent variable has a positive relationship with life expectancy, I expect the same variable to have a negative relationship with infant mortality rate. In the following paragraph, I will describe the expected signs on the explanatory variables in relation to life expectancy; the opposite sign is expected between the explanatory variables and infant mortality rate.

I expect Real GDP/capita (current USD) to have a positive relationship with life expectancy. A wealthier country with a more advanced economy will have more money to spend

on health products and services. The standard of living and healthcare is also higher in a wealthier country, which also positively affects health outcomes.

I believe corruption deteriorates health outcomes and will lower life expectancy. Corruption lowers the quality of health services and in some cases even the quantity. The legitimacy of healthcare as well as the patient-doctor relationship are both compromised by corruption. Both ICRG and Transparency International have scored corruption in a similar way- a higher score means a country is less corrupt. Therefore, I expect a positive sign with my corruption measurements and life expectancy; a less corrupt country will have better health outcomes.

Government stability should have a positive sign with life expectancy because a more unified and legislatively powerful government should lead to better health outcomes. Oftentimes, the government has a significant role in delivering and regulating healthcare. If a government is able to pass legislative reforms and programs regarding healthcare, health outcomes in a country should rise.

Law and order should have a positive sign because a strong legal system and a more orderly society reflect better institutions. I believe better political, legal, and economic institutions coincide with a more advanced nation with better health outcomes.

I expect democratic accountability to have a positive relationship with life expectancy. A government that is more responsive to the peoples' needs builds trust among the population and passes reforms reflecting the peoples' wants and needs. Most people value healthcare very highly, and a government that listens to the people and makes it a top priority will institute

reforms and programs in the healthcare sector. These reforms and programs will lead to better health outcomes such as higher life expectancy and lower infant mortality rate.

I believe urban population can have either a positive or negative relationship with life expectancy. Particularly in developing and underdeveloped countries, people living in rural areas have very limited access to health care services. In such countries, health care services are more likely to be concentrated in urban areas. If a higher percentage of people of a country live in urban areas, overall health outcomes will increase because more people will have easier access to healthcare. In contrast, urban areas have more congested and polluted living conditions which negatively impact health. Also, people in congested areas may have limited access to health care because there are so many people and just a few health care providers. This may also contribute to a negative relationship between urban population and life expectancy.

In the panel estimation, there will be 2 equations I will run separately. Equation 1 (j=1) will measure health outcomes with life expectancy and Equation 2 (j=2) with infant mortality rate. Since x_{t3} and x_{t7} are both corruption variables, I will not include both in the regression simultaneously. For example, I will first run Equation 1 with all variables except x_{t7} and then run it with all variables except $x_{t3.}$

Regression Equation to be Estimated:

$$Y_{itj} = \beta_0 + \beta_1 x_{it1} + \beta_2 x_{it2} + \beta_3 x_{it3} + \beta_4 x_{it4} + \beta_5 x_{it5} + \beta_6 x_{it6} + \beta_7 x_{it7} + \alpha_{it} + \varepsilon_{itj}$$

i=1.., 30 (countries) t= 1.., 16 (years)

j=1, 2 ; Y_{it1}=Life expectancy (at birth) ; Y_{it2}= infant mortality (per 1000 live births)

x_{it1}.., x_{it7} are as defined before.

IV. Results

The regression results for Equation 1 and 2 were quite interesting. The most accurate and significant results of both equations came from a panel estimation of fixed two way estimates. The fixed two way estimates includes both the cross-section and time effect.

For Equation 1, the fixed two way estimates incorporating x_{t3}, the ICRG corruption estimate, yielded the most significant results. x_{t3}, the variable measuring corruption, had a coefficient value of 0.16 (Table 1). It had a T-value of 4.27, which gives it a p-value way below $\alpha = 0.05$ and makes it statistically significant. Real GDP/capita (current USD) or x_{t1} surprisingly had a significant coefficient value of -0.00103, but it was not statistically significant ($\alpha = 0.05$). x_{t4}, law and order, and x_{t6}, urban population were also significant at $\alpha = 0.05$. The coefficient on x_{t4} was 0.20 and the coefficient on x_{t6} was 0.06. The overall model had a coefficient of determination or R-squared value of 0.9973, meaning the data fit the statistical model well.

For Equation 2, the fixed two way estimates incorporating x_{t7}, the Transparency International corruption perceptions index, had significant results. x_{t7} had a coefficient value of -1.15, with a T-value of -2.85 and p-value of 0.005 (Table 2). Thus, the estimate was significant at $\alpha = 0.05$. Additionally, x_{t1} unexpectedly had a coefficient value of 0.051 and a T-value of 5.77, which made it significant at $\alpha = 0.05$. x_{t6} had a coefficient value of -0.74, which made it significant at $\alpha = 0.05$. The R-squared value of the model was 0.9861, making the model a good fit for the data.

In addition to panel estimation, four simple correlation analyses were conducted: correlation between y_{t1} and x_{t3}, y_{t1} and x_{t7}, y_{t2} and x_{t3}, and y_{t2} and x_{t7} (Table 3). The results were scattered but there were three countries that had statistically significant ($\alpha = 0.05$) results for all

four correlations that aligned with expected results. For Belgium, the correlation between y_{t1} and x_{t3} was 0.53, for y_{t1} and x_{t7} it was 0.66, for y_{t2} and x_{t3} it was -0.39, and for y_{t2} and x_{t7} it was -0.69. For France, it was respectively 0.59, 0.44, -0.46, and -0.48. For Colombia, it was respectively 0.76, 0.72, -0.76, and -0.72.

Furthermore, regressions of equation 1 and equation 2 were run separately on 15 OECD countries and 15 Non-OECD countries. For OECD countries, the results of equation 1 and equation 2 for both measures of corruption are listed in Tables 4-7. For both the dependent variables, Transparency International's CPI (x_{t7}) had more significant results than the ICRG corruption measurement (x_{t3}). With Pooled OLS Estimates of OECD countries, x_{t7} had a coefficient value of 0.0488 for the regression with life expectancy and -0.118 for the regression with infant mortality rate. Both of these values were significant at the 5% level. For Non-OECD countries, the results of equation 1 and equation 2 for both measures of corruption are listed in Tables 8-11. With Pooled OLS Estimates of Non-OECD countries, , x_{t7} had a coefficient value of 0.396 for the regression with life expectancy and -1.99 for the regression with infant mortality rate. Both of these values were also significant at the 5% level.

V. Interpretation of Results

Most of the econometric results aligned with what was expected while some differed. Of all the variables, only corruption, Real GDP/capita (current USD), law and order, and urban population were significant in either of the structural equations. Although many of the other variables had estimates that coincided with expectations, the estimate was not statistically significant at $\alpha = 0.05$.

I had expected corruption to detriment health outcomes, causing life expectancy to go down and infant mortality rate to increase. Life expectancy was the dependent variable in equation 1. The coefficient of x_{t3} (ICRG corruption) in the panel estimation was 0.16, meaning a 1 point increase in the corruption measurement coincided with about a 0.16 year increase in life expectancy. Since a higher corruption measurement means less corruption in that country, the estimated value makes sense. A less corrupt country should have a higher life expectancy. Infant mortality rate (per 1000 live births) was the dependent variable in equation 2. The coefficient of x_{t7} (CPI) in the fixed two way panel estimation was -1.15. In this case, a 1 point increase in the CPI (less corruption) causes a 1.15 decrease in the infant mortality per 1000 live births. This aligned with the expected negative relationship between the two variables. Since a higher CPI means a country is less corrupt, CPI and infant mortality rate exhibit a negative relationship. A less corrupt country will have a higher CPI and a lower infant mortality rate.

Real GDP/capita (current USD) had an insignificant coefficient value of -0.00103 in equation 1 and a significant value of 0.0515 in equation 2. According to the estimation, a $1 increase in Real GDP/capita would lower life expectancy by about 0.00103 years and raise the infant mortality rate by about 0.0515. These values are the opposite sign of what was anticipated in both equations. I expected a country with a higher GDP/capita to have more resources to spend on healthcare and consequently better health outcomes. Perhaps there are other factors affecting the relationship between Real GDP/capita and health outcomes and skewing the results. Considering the time-series component of panel estimation, the world has rapidly adopted a global economy that has increased the Real GDP/capita for many countries around the world in the last two decades. This pervasive economic growth has been coupled with a lack of any major

medical advancement to improve overall health outcomes of a population. As a result, the relationship between Real GDP/capita and population health levels may be skewed.

The results for law and order (x_{t4}) and urban population (x_{t6}) corresponded to the expected relationships with life expectancy and infant mortality rate. In equation 1, x_{t4} had an estimated coefficient of 0.20. This means that a 1 point increase in law and order would increase life expectancy by about 0.20 years. This makes sense because a country with more law and order will have strong institutions that can monitor and act against corruption. Although statistically insignificant, the estimated coefficient of x_{t4} in equation 2 is -0.45, which means a 1 point increase in law and order will decrease infant mortality per 1000 live births by about 0.45. In both cases, a country with more law and order will have better health outcomes.

In equation 1, urban population (x_{t6}) had an estimated coefficient of 0.06. A 1% increase in a country's urban population would increase its life expectancy by about 0.06 years. In equation 2, x_{t6} had an estimated value of -0.74. A 1% increase in a country's urban population would decrease infant mortality rate per 1000 live births by about 0.74. In both equations, a larger urban population led to better health outcomes. The results reflect the notion that people in urban areas have better access to health services than people living in rural or remote areas.

In the regression with just OECD countries, x_{t7} had a coefficient value of 0.0488 for life expectancy and -0.118 for infant mortality rate. This means that a 1 point increase in an OECD country's corruption perceptions index (less corruption) would increase life expectancy by about 0.0488 years and decrease the infant mortality rate by 0.118 per 1000 live births. Likewise, x_{t7} in the regression with Non-OECD countries had a coefficient value of 0.396 for life expectancy and -1.99 for infant mortality rate. This means that a 1 point increase in a Non-OECD country's

corruption perceptions index (less corruption) would increase life expectancy by about 0.396 years and decrease the infant mortality rate by 1.99 per 1000 live births. Both of these results conform to our prediction that less corruption improves health outcomes and that corruption affects health outcomes in both rich and poor countries. However, corruption seems to affect health outcomes more in developing Non-OECD countries that it does in richer and more developed OECD countries. The same change in the level of corruption has a bigger effect on life expectancy and infant mortality rate in Non-OECD countries than in OECD countries. Although it may be tougher to institute anti-corruption reforms in Non-OECD countries, the reforms will have a bigger positive effect on health outcomes than they would have in OECD countries. Therefore, in terms of health outcomes, it is well worth the extra difficulty to make anti-corruption reforms a reality in poorer, developing nations.

VI. Conclusions

Health outcomes improve in a country when life expectancy increases and infant mortality decreases. There are numerous factors that ultimately affect health outcomes, but corruption is one that is often overlooked. From the panel estimation, I found that corruption negatively impacts health outcomes. The effect of corruption on health outcomes is larger in Non-OECD countries compared to OECD countries. Good governance practices, particularly more law and order, improve health outcomes. Finally, a country that has a larger urban population percentage typically has better health outcomes.

There are several reforms countries must undertake in order to reduce corruption and improve health outcomes. First and foremost, there needs to be more transparency in all areas of the healthcare sector. This includes but is certainly not limited to transparency of physician-

patient relationships, physician and industry ties, and connections between company and governmental regulatory agencies. Transparency is vital because it leads to corruption being exposed and financial accountability of public spending. Healthcare spending needs to be accounted for to ensure there are no leakages that go towards corruption.

Additionally, every country must have an impartial ombudsman office that monitors, regulates, and acts against corruption. The office should be independent of the government so it does not act on political ties. The ombudsman must be given ample resources and authority to perform its functions and duties. The ombudsman must also protect whistleblowers that uncover and expose corruption practices. Whistleblowers must feel safe and protected against the consequences of exposing corruption.

Finally, strict anti-corruption laws must be enacted and a zero tolerance policy towards corruption must be introduced. The problem is that corruption is an ingrained part of the healthcare culture in various countries. Corruption is sometimes not viewed as unequivocally unacceptable. The culture of corruption in healthcare must be changed to stress that corrupt practices will not be taken lightly. The public and the healthcare community need to emphasize that corruption in healthcare is not a minor thing but rather that it has immense and pervasive adverse effects. A change in perception of corruption will decrease the amount of people who engage in corruption simply because it is the cultural norm. A zero tolerance policy towards corruption will take a definitive stance against corruption and should deliver deservedly harsh punishments to corrupt individuals.

In the near future, I hope there is more data available on corruption in healthcare specifically. In the model used in this paper, corruption measurements signified the overall level

of corruption in a country, not the corruption level in healthcare specifically. With more specific corruption data available, the analysis of corruption and health outcomes will lead to better results and conclusions. Based on better conclusions, more specific and pragmatic policy recommendations can be made to tackle corruption in healthcare. Health outcomes can't afford to suffer any further from corruption in health care.

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Appendix

Table 1: Correlation Results of Life Expectancy (Y_{t1}) and Infant Mortality Rate (Y_{t2}) with ICRG Corruption (x_{t3}) and Transparency International CPI (x_{t7})

Country	Correlation between y_{t1} and x_{t3}	Correlation between y_{t1} and x_{t7}	Correlation between y_{t2} and x_{t3}	Correlation between y_{t2} and x_{t7}
Australia	-0.51 (.04)	0.24	0.34	-0.19
Belgium	0.53 (.03)	0.66 (.0054)	-0.39	-0.69 (.0029)
Canada	-0.70 (.0023)	-0.72 (.0016)	0.47	0.36
Denmark	-0.73 (.0013)	-0.64 (.0074)	0.723 (.00160)	0.65 (.0063)
Finland	-	-0.39	-	0.39
France	0.59 (.01)	0.44 (.08)	-0.46 (.07)	-0.477 (.06)
Germany	0.057	-0.057	0.023	0.08
Greece	-0.88 (.01)	-0.80 (.002)	0.94 (.001)	0.76 (.005)
Ireland	0.20	-0.23	-0.27	0.16
Israel	-0.36	-0.85 (.001)	0.44 (.08)	0.88 (.001)
Japan	0.04	0.82 (.001)	0.04	-0.77 (.005)
Mexico	-0.35	0.07	0.40	-0.21
New Zealand	0.61 (.01)	0.22	-0.63 (.001)	-0.33
United Kingdom	-0.90 (.001)	-0.68 (.0032)	0.90 (.001)	0.71 (.01)
United States	-0.23	-0.76	0.30	0.70
Brazil	-0.25	-0.002	0.29	-0.023
China	0.30	0.68 (.0034)	-0.39	-0.65 (.006)
India	-0.44 (.08	0.78 (.004)	0.44 (.08)	-0.77 (.0004)
Jordan	-0.71 (.002)	0.19	0.71 (.002)	-0.20
Bangladesh	0.40	0.49	-0.40	-0.48
Lebanon	0.26	-0.43	-0.21	0.41
Nigeria	0.14	0.82 (.001)	0.01	-0.79 (0.001)
Pakistan	-0.49 (.05)	0.32	0.48 (.059)	-0.34
Romania	-0.57 (.02)	0.53 (.04)	0.60 (.013)	-0.65 (.008)
Philippines	-0.65 (.005)	-0.69 (.0025)	0.66 (.005)	0.69 (.003)
Venezuela	-0.92 (.001)	-0.87 (.001)	0.92 (.001)	0.8 (.002)
Ghana	-0.49 (.04)	0.72 (.004)	0.54 (.02)	-0.66 (.009)
Argentina	0.08	-0.34	-0.08	0.34
Colombia	0.76 (.0005)	0.72 (.0014)	-0.76 (.0006)	-0.72 (.0013)
Thailand	-0.44 (.08)	0.61 (.01)	0.63 (.0083)	-0.64 (.0076)

*Note: P-values only indicated for estimates significant at 5% level

Table 2: Regression Results for Fixed Two Way Estimates

Dependent variable:	Life expectancy	Infant mortality rate
Real GDP/capita	-0.00103	0.051476*
	(0.3596)	(< 0.0001)
Government stability	-0.0182	-0.11096
	(0.3178)	(0.4420)
Law and order	0.196346*	-0.4517
	(< 0.0001)	(0.1922)
Democratic accountability	0.0597	-0.51166
	(0.1023)	(0.1070)
Urban population	0.056075*	-0.73899*
	(< 0.0001)	(< 0.0001)
ICRG corruption	0.164944*	
	(< 0.0001)	
TI's CPI		-1.14681
		(0.0046*)
Constant	70.73153*	47.10687*
	(< 0.0001)	(< 0.0001)
R-squared	0.9973	0.9861
N	480	480

*Significant at 5% level

Table 3: OECD Countries Regression Results incorporating ICRG Corruption

Independent variable:	Real GDP/capita	Government stability	ICRG corruption	Law and order	Democratic accountability	Urban population
Fixed One Way Coefficients (Yt_1)	0.00538*	0.380574*	-0.64319*	-0.55093*	0.911827*	0.178668*
Pooled (OLS) Coefficients (Yt_1)	0.004373*	0.234415*	-0.2545*	-0.11158	0.580794*	0.022371*
Between Groups Coefficients (Yt_1)	-0.00394*	0.123809	-0.07134	0.293611*	-0.15516	0.004858
Between Time Periods Coefficients (Yt_1)	-0.02277	1.088365*	-2.30402	7.164829*	0.906321	1.961791*

GMM: First Differences Transformation Coefficients (Yt_1)	0.001984*	-0.02622	0.170054	-0.22823	0.216419	-0.1104
Fixed One Way Coefficients (Yt_2)	-0.00492*	-0.51084	0.567721	0.817504	-1.45807	-0.19886
Pooled (OLS) Coefficients (Yt_2)	-0.00545*	-0.33267*	0.186145	0.192328	-0.84258*	-0.02663
Between Groups Coefficients (Yt_2)	0.00314	0.008788	0.021661	-0.36711*	0.170467	-0.00401
Between Time Periods Coefficients (Yt_2)	0.019349	-0.87307*	1.965084	-6.11035*	-0.52711	-1.59932*
GMM: First Differences Transformation Coefficients (Yt_2)	0.000232	0.013221	-0.01843	0.064422	0.186941*	0.068805*

*Significant at 5% level

Table 4: OECD Countries Regression Results incorporating Transparency International's CPI

Independent variable:	Real GDP/capita	Government stability	TI's CPI	Law and order	Democratic accountability	Urban population
Fixed One Way Coefficients (Yt_1)	0.003421	0.340871*	-0.49748*	-0.4891*	0.838081*	0.215765*
Pooled (OLS) Coefficients (Yt_1)	0.004279*	0.20011*	0.048759*	-0.32779*	0.42774*	0.012642
Between Groups Coefficients (Yt_1)	-0.00162	0.087303	-0.06174	0.248637	-0.01627	0.004811
Between Time Periods Coefficients	-0.0331	1.467294*	3.326517	6.533533*	-1.31532	2.7385*

GMM: First Differences Transformation Coefficients (Yt_1)	0.00021	-0.09255*	0.171224	0.204709	0.507414*	0.019527
Fixed One Way Coefficients (Yt_2)	-0.00293	-0.48985	0.620684*	0.790788*	-1.48343	-0.24657
Pooled (OLS) Coefficients (Yt_2)	-0.00552*	-0.31032*	-0.11831*	0.479918	-0.69967*	-0.01701
Between Groups Coefficients (Yt_2)	0.001528	0.026683	0.045086	-0.35786	0.050244	-0.00485
Between Time Periods Coefficients (Yt_2)	0.028168	-1.22*	-2.76138*	-5.63158*	1.269707	-2.27383*
GMM: First Differences Transformation Coefficients (Yt_2)	-0.00065	0.027294*	-0.05154*	0.112687	0.261992	0.068065

*Significant at 5% level

Table 5: Non-OECD Countries Regression Results of Life expectancy (Y_{t1})

Independent variable:	Real GDP/capita	Government stability	Law and order	Democratic accountability	Urban population	ICRG Corruption	TI's CPI
Fixed One Way Coefficients	-0.01326	0.423074*	-0.0509	0.777362*	0.22743*	-0.88603*	
Fixed One Way Coefficients	-0.00377	0.361307*	-0.5213	0.434063	0.128032		
							0.33508
Pooled (OLS) Coefficients	0.011523	0.335903*	0.01336	0.306202*	0.010179	-0.4541	
Pooled (OLS) Coefficients	0.010056	0.238056*	-0.16808	0.205761	-0.00412		0.39641*
Between Groups Coefficients	0.026357	-0.28836	0.44485	-0.27756	0.002045	0.41723	

Between Groups Coefficients	-0.00161	-0.32105	0.26154	-0.11084	0.001955		0.444161
Between Time Periods Coefficients	0.602696*	1.514457*	-4.1556	3.66240	-1.67229	-4.87685	
Between Time Periods Coefficients	0.204443	1.515948*	-2.45243	1.819082	-0.3767		2.454937
GMM: First Differences Transformation Coefficients	-0.00206	-0.00402	-0.0216	0.076663	-0.0276*	0.003998	
GMM: First Differences Transformation Coefficients	-0.00112	0.016407	-0.02918	0.006104	-0.01254		0.14529*

*Significant at 5% level

Table 6: Non-OECD Countries Regression Results of Infant Mortality Rate (Y_{t2})

Independent variable:	Real GDP/capita	Government stability	Law and order	Democratic accountability	Urban population	ICRG Corruption	TI's CPI
Fixed One Way Coefficients	0.07348	-1.66924*	-0.30691	-0.28686	-1.1767*	2.56425	
Fixed One Way Coefficients	0.045811	-1.45336	0.69182	1.074549	-0.8677		-3.07767
Pooled (OLS) Coefficients	-0.00711	-1.30737*	0.53079	-0.99159*	-0.02809	0.771534	
Pooled (OLS) Coefficients	-0.03825	-0.96645*	0.90508	-0.54192	0.014964		-1.9892*
Between Groups Coefficients	0.01304	0.581007	-0.91534	0.021637	-0.02505	-1.57752	
Between Groups Coefficients	0.028927	0.31506	0.41275	-0.30411	-0.02081		-1.22517

Between Time Periods Coefficients	0.598859	-3.38038	-10.1243	7.982211	-4.59763	2.530418	
Between Time Periods Coefficients	-1.00908	-7.39955	11.868	-8.6859	1.934578		-12.0383
GMM: First Differences Transformation Coefficients	0.005326	0.000171	0.06588	-0.0876	0.08364*	-0.16733*	
GMM: First Differences Transformation Coefficients	0.001987	-0.01115	0.07684	-0.06004	0.08091*		-0.23071

*Significant at 5% level