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Corruption and Economic Growth in China: An Emirical Analysis

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Introduction

China's rise to a global economic superpower in the last 35 years has been nothing short of extraordinary. Factors that have played a part include China's liberalization of its financial system, opening up to foreign markets, and massive comparative advantage in labor. An intriguing issue, and the focus of this paper, involves the role that corruption has played in China's unprecedented economic growth.

Corruption is an intriguing issue in part because the literature disagrees on its potential economic impacts. On the one hand, some research finds that corruption is detrimental to economic growth, and this is no different in China (Cole, Elliott, and Zhang 1-32, Bergsten, Freeman, Lardy, and Mitchell 91-105). The elimination of corruption is necessary in order for China's economic growth to be sustainable in the future. Alternatively, other evidence suggests that corruption is a way for firms to sidestep the regulations put in place by governments (Egger and Winner 932-952, Jiang and Nie 366-369). Without corruption, businesses would not be able to succeed in China because the regulations are too strict. This paper will explore various effects of corruption in China, and the direction China will move in the future as a global superpower.

This paper will begin with a review of the relevant literature on corruption and its effect on economic growth, both in general and in China specifically. The following sections will discuss the state of corruption in China and outline China's historic economic growth since it opened up to the global economy. Next, the methodologies of the empirical study of this paper and a model for measuring the effects of corruption on economic growth will be presented. Finally, the results of this study will be analyzed, followed by a discussion of policy implications as China moves forward in the 21st century.

Literature Review

Corruption is certainly one of the biggest challenges faced by governments and policymakers in all countries from fully-developed to highly underdeveloped. The literature on corruption is largely inconclusive due to difficulty in measuring corruption precisely, and therefore difficulty in pinpointing its effect. Though some literature may find corruption to be a boon to growth, it is important to note that this is in a very specific context. In an ideal society, almost all arguments fall in the camp claiming corruption is detrimental. However, in the presence of poor institutional infrastructure or economically restrictive regimes, corruption allows firms to sidestep strict regulations and red tape. Corruption is ideally eliminated in the long run as a country transitions from developing to fully developed.

Empirical studies find strong evidence that corruption promotes investment. Egger and Winner analyze the situation in 73 developed and less developed countries and find that corruption is a stimulus for foreign direct investment (FDI). They argue this is a way firms circumvent regulations in relatively highly regulated economies (949). However, they make very clear that this study does not support corrupt regimes. The best policy is eliminating rigid regulatory controls rather than circumventing them. This supports the idea that corruption is beneficial only in a very specific context.

Turning to China, the evidence suggests that corruption has a different effect on FDI. A study on FDI location in China finds that firms are more likely to locate in provinces that do more to prevent corruption. The evidence further suggests that provinces with more efficient regional governments are more likely to attract higher levels of FDI (Cole, Elliott, and Zhang 19). This seems to contradict the previous evidence that finds countries with high levels of corruption tend to attract more investment. Paulo Mauro, an economist with the International Monetary

Fund, finds results that support the research of Cole, Elliott, and Zhang. Using regression analysis to estimate the impact corruption has on investment, he notes the inverse relationship between the two. He finds that one standard deviation decrease in the level of corruption in a country can contribute to 4% growth in FDI in that country (Mauro 9).

Using firm performance as a contextual framework for measuring the effects of corruption, studies find more consistent results. In a study of firm profitability in China, higher profitability is correlated with higher levels of regional corruption (Jiang and Nie 369). This was the case for private firms only, as state-owned enterprises (SOEs) had less incentive to bribe officials. Also, this correlation was stronger "when regulation is rigid than when it is relaxed," indicating that regulatory governments may incentivize corruption (Jiang and Nie 369). When regulation is held constant, firms that are able to circumvent this regulation will be more profitable. While this study does note the positive effects of corruption on firms, it concludes that corruption is fueled by high regulation; in order to eliminate corruption, governments must relax their regulation of the free market (Jiang and Nie 369).

A study on corporate tax avoidance finds a similar role of corruption in the Chinese economy. In this study, corporate tax avoidance is found to be a competitive advantage for firms in a market where institutional infrastructure is relatively poor (Cai and Liu 794). In this way, given the presence of poor institutional infrastructure, corruption can be beneficial. However, the authors argue that as China transitions into a high-income economy, its best long-term interest is to strengthen its institutional infrastructure to limit tax avoidance (Cai and Liu 794). Although tax avoidance may give a short-term competitive advantage to firms, this missing tax revenue lowers government expenditure on necessary public goods like infrastructure and education.

Even the initial positive effects of corruption create long-term problems for economic growth and development.

The lack of conclusive evidence of corruption's impact on economic growth stems from the difficulty in measuring it. Many corruption measures are surveys, such as Transparency International, which can be subjective. Still, these surveys can be reliable, as they "report remarkably similar judgments on individual countries" (Mauro 8). But even if the perception of corruption is similar across surveys, actually measuring what this means and how it effects the economic environment of a country is difficult. Other measures of corruption use specific metrics, like news reports of corrupt activity (Ramirez 76-91) or corruption-related cases filed (Jiang and Nie 366-369; Cole, Elliott, and Zhang 1-32). These methods provide a more quantitative measure of corruption, but can capture the effect of other variables like institutional effectiveness and bureaucracy, making isolation of the effect of corruption difficult. This paper will add to the discussion of the effect of corruption by constructing a model that attempts to control for other determinants of economic growth in order to isolate the effects of corruption. The specifics of this model will be explained in later sections.

Corruption in China

Every large institution, public or private, nation or corporation, faces the problem of corruption, and China is no different. From its imperial history, through the Chinese Civil War and the Nationalist Government, to the Communist People's Republic of China under Mao Zedong, to modern China after the reforms of the late 70s, corruption has been present at every level of government. As China has risen to the status of a global economic superpower, corruption in its government has become a topic of discussion and debate in academics, media, business, and politics.

China's Rise: Challenges and Opportunities, a book detailing the changes China has gone through in the last half century, cites the negative sociopolitical effects of corruption in China, but admits that it has "yet to undercut growth rates or deter foreign direct investment" (Bergsten, Freeman, Lardy, and Mitchell 92). In fact, the authors believe that corruption is probably a byproduct of economic growth, as gains from corruption serve as an incentive for officials. They note the gains officials make when skimming off the top of government investments in real estate (Bergsten, Freeman, Lardy, and Mitchell 95-96). This illegal lending may actually be a boon to economic growth as it encourages investment and economic growth. Still, the authors hold that the long-term interests of China's economy are best served by stamping out corruption.

Political leaders in China agree with the authors of *China's Rise: Challenges and Opportunities* and others who believe reduction of corruption is necessary. Former President Hu Jintao is emphatic in this belief, stating, "If we fail to handle this issue well, it could prove fatal to the party, and even cause the collapse of the party and the fall of the state" (Brown). Current President Xi Jinping has taken action on this issue, and quotes Confucius, saying, "Govern with virtue and keep order through punishments" (Keliher and Wu). Keeping order through punishments has indeed become the theme of the Xi presidency. In 2012 alone, 414 thousand party officials were disciplined, including over 201 thousand prosecuted in court (Keliher and Wu). The Xi administration has termed its crackdown on corruption "Killing Tigers and Swatting Flies" (Keliher and Wu). "Tigers" refer to corrupt upper-level party officials, while "flies" refer to corrupt lower-level regional officials and government workers.

The Xi administration emphasizes the importance of handling the "flies," whose negative impact on society can be the most damaging. Still, this notion has not distracted the Xi

administration from taking down "tigers." Multiple upper-level officials have fallen from power due to corruption related offenses. These names include Xu Caihou, the retired vice chairman of the central military commission who is the highest military official to face prosecution, Zhou Yongkang, former security chief and member of the politburo standing committee, Ling Jihua, former vice-chairman of the Chinese people's political consultative conference committee, Jiang Jiemin, former politburo standing committee member and head of the state-owned asset supervision and administration commission, and Liu Tienan, director of the top economic planning committee (Branigan).

China watchers in the media criticize the current crackdown on corruption as an attempt by Xi Jinping to consolidate political power and take down his opponents (Denyer). An article in the Economist states, "It is possible Mr. Xi is merely grappling with the far-reaching corruption… But there are hints he is up to more" (The Economist). Regardless of whether or not Xi's anti-corruption efforts are genuine, the recent crackdowns on corruption have for better or worse brought corruption in China to the world stage.

Still, much work remains to be done in the fight against corruption. Transparency International, a non-governmental organization that ranks countries on the perceived level of corruption, ranks China currently at 100 out of 175 surveyed countries. It scored a 36 out of 100, where 100 is the least corrupt, leaving plenty of room for improvement (Transparency International). China has been steadily improving since the late 1990s, but has not improved much in the past 10 years, despite the reforms to combat corruption (Cole, Elliott, and Zhang 5). China must continue its fight against corruption or risk facing the fate that Former President Hu Jintao and others have warned against.

Economic Growth in China

From 1949-1978, China's economy was stagnant. A command economy, all but wholly owned and operated by the government, it was unable to realize the rapid economic growth of its market-oriented counterparts in the West. Mirroring the Soviet economy, central planners controlled allocation of resources goods, prices, and production (Naughton 59). Mismanagement of resources, especially grain and other food sources, led to the Great Famine. Reaching its peak in 1960-61, China experienced the largest famine of the 20th century. Populations, especially those of rural provinces like Sichuan, were devastated. In total, an estimated 25-30 million people died. The famine ended by 1962, and a period of readjustment ensued (Naughton 72-74). Political instability and a static economy continued throughout the 1960s and 70s. Not until the death of Mao Zedong in 1976 did China begin its transition.

Deng Xiaoping took office in 1978 and began the reforms of China's economy that would set in motion the fastest economic rise in history. At the time when Deng Xiaoping took office, China accounted for approximately 0.5% of global economic output. Now, China accounts for about 10% (Bergsten, Freeman, Lardy, and Mitchell 3). To accomplish this growth, China adopted a dual-track system of command and market-based economies to ease its transition (Naughton 90-92). Naughton concludes, "China avoided a Soviet-style collapse by disentangling itself gradually from the institutions of the planned economy" (91).

By the 1990s, China had abandoned the traditional planned economy, and market forces dominated (Naughton 101). A result of a more market-based economic policy is reflected by China's FDI stock, which increased by $297 billion from 1990 to 2005 (Cole, Elliott, and Zhang 2). From 1980 to 2000, China's exports grew by 13% per year, making it the world's third largest exporter by 2006 (Cole, Elliott, and Zhang 2). China joined the World Trade

Organization in 2001, further illustrating its intent to open up to world trade (Naughton 105).

Overall, China has enjoyed an average GDP growth rate of around 10% per year and has lifted

over 500 million people from poverty (World Bank 2015).

While China has realized unprecedented growth since the late 1970s, it faces many

challenges that accompany high growth rates. Income inequality is one such problem. To

measure income inequality, the Gini coefficient is often applied. This coefficient ranges from 0

to 1, with 0 signifying perfect income equality, and 1 meaning all the income is owned by one

individual. In the 1980s, China's Gini coefficient was 0.28, making it one of the more equally

distributed countries in the world with respect to income. Compare that number to the United

States, which had a Gini coefficient between 0.30 and 0.35 in the 1980s (OECD 24). Such a low

Gini coefficient is surprising for a larger country like China, especially so early on in its growth

cycle (Naughton 217). However, as China has developed, its income inequality has increased,

mainly driven by the inequality between urban and rural incomes. This issue is closely linked to

corruption, as political and legal reform is required to level the field in China and "reduce special

privileges" that politicians and urban elite often enjoy (Naughton 220).

Another issue impossible to ignore resulting from China's economic growth is the

environment. China's massive population and economic output make it a world leader in

consumption of non-renewable resources and energy. Since 1990, China's coal use has doubled

to 2 billion tons in 2005, a main driver of China's air pollution issues (Naughton 489). The

World Bank produced a study to quantify the costs of China's pollution, and calculated the cost

at $54 billion per year, nearly 8% of GDP (*Clear Water, Blue Skies* 24).

Sustainability is also a concern, as China faces issues with soil erosion, loss of forests and

grasslands, and destruction of animal species and habitats (Naughton 489). It is up to government

regulation to internalize the externality of environmental degradation, and without proper rule of law, this is difficult to achieve. For this reason, corruption, which allows firms to circumvent government regulation through bribery, poses a threat to sustainability.

China's growth and development since 1978 has been extraordinary and presents it with a number of challenges moving forward. Related to many of these challenges is the issue of corruption. In order to continue sustainable economic growth, China must work to lessen the impact of corruption. The following sections in this paper will construct a model to quantify the importance of fighting corruption in the interest of economic growth.

Methodologies

In order to determine the effects of corruption on economic growth in China, a regression model is used. Provincial income[1] is used as the measure of economic growth. The model constructed by Robert Barro (1998) in his paper "Determinants of Economic Growth: A Cross-Country Empirical Study" is used as a framework for the model of this paper. Barro finds, through empirical research of 100 countries from 1960 to 1990, that gross domestic product (GDP) of a nation "is enhanced by higher initial schooling and life expectancy, lower fertility, lower government consumption, better maintenance of the rule of law[2], lower inflation, and improvements in the terms of trade" (2). The model constructed in this paper will use independent variables to control for these determinants of growth in order to isolate the effects of corruption. The variables chosen and the rationale for including them in the model are outlined in the following paragraphs.

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[1] Provincial income is measured as the province's share of Gross Domestic Product. Data from Deutsche Bank Research (2015).
[2] In this model, maintenance of the rule of law is partially captured by the measure of corruption, which will be discussed later in this section. Due to issues with multicollinearity, a separate measure of the rule of law will not be used.

To measure schooling, the illiteracy rate[3] (*Illitrt)* of a province is used. This rate is calculated by dividing the number of people 15 years of age or older who are illiterate or semi-literate by the total population of people 15 years of age or older. The expected sign on the coefficient of this variable is negative, as a less literate population is likely less educated. Less education contributes to a lower level of human capital and a lower technological growth rate (Barro 15-16).

Life expectancy[4] (*LifeExp)* is included in this model as a determinant of GDP. Life expectancy serves as a proxy for health level and quality of human capital (Barro 17). For this reason, the coefficient on this variable is expected to have a positive sign.

Population growth rate[5] (*PopGrowthrt*) is used to measure fertility rate of a province. Empirical studies have suggested that a lower fertility rate is associated with a higher growth rate of GDP. This is because higher fertility rates forces an economy to provide human capital to new workers, rather than increasing human capital for existing workers (Barro 18). Therefore, the coefficient on this variable is expected to have a negative sign, as an increase in fertility will likely decrease GDP.

Government consumption is measured by total government expenditure (*GovExpen*) within a province. Barro notes that in particular, expenditure on non-productive outlays contributes to a decline in GDP growth rate (18-19). However, this model will use total government expenditure for two reasons. First, in order to better isolate the effects of corruption

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[3] Data for illiteracy rate was not available for the year 2003, so the average of 2002 and 2004 was used for each province. Data from China Statistical Yearbook.

[4] Data for life expectancy was only available in 1990 and 2000. A simple average was used to calculate an average growth rate. This growth rate was applied to interpolate life expectancy from 1998-2003. Data from China Statistical Yearbook.

[5] Population growth rate was not available for the years 2000 and 2003, so averages of 1999 and 2001, and 2002 and 2004, respectively, were used for each province. Data from China Statistical Yearbook.

on economic growth, this model attempts to control for all factors that may contribute either

positively or negatively to growth. Second, if non-productive outlays increase, total expenditure

is expected to increase as well, assuming a constant ratio of productive and non-productive

outlays. The expected sign on the coefficient of this variable is negative, as an increase in

government expenditure will likely result in a decrease in GDP growth.

Economic theory argues that high levels of inflation indicate price instability, which can

retard economic growth rates. Barro's empirical analysis finds that high inflation rates do in fact

slow economic growth, and concludes that inflation's effect on economic growth is most

significant in extreme cases (15-20% or more). Barro cautions that though extreme cases of high

inflation have the most adverse effects, low levels of price instability still have a moderate

negative effect on economic growth (68-69). Therefore, the coefficient on the inflation (π)

inflation variable in this model is expected to have a negative sign.

Terms of trade measure a country's ratio of import to export prices in order to determine

exporting's impact on real GDP. This means that export prices must be high enough to offset

imports and have a positive effect on GDP (Barro 20). Because China has used exports as the

main driver of its economic growth, it is assumed to have a positive impact on real GDP.

Therefore, the level of total provincial exports (*Exp)* is used as the variable in this model to

represent terms of trade. The coefficient on this variable is expected to have a positive sign,

because an increase in exports should increase GDP.

Other variables in this model that are not included in the Barro framework include

foreign direct investment (*FDI*), population (*Pop*), area (*Area*), population weighted expressways

(*PopExp)*, Special Economic Zone (*SEZ*), real wage growth (*WageGrowth*), and unemployment

rate (*Unemrt*). These variables are included to control for factors that might influence economic

growth. Empirical evidence suggests that foreign direct investment positively affects economic growth, so the expected sign for the coefficient of this variable is positive (Borensztein and De Gregorio 133-134). Population and area are included to control for the size variation among provinces. Population weighted expressways serves as a proxy for infrastructure. Whether infrastructure causes or is caused by economic growth is up for debate and beyond the scope of this paper, but its possible effect must be controlled. Since better infrastructure is generally correlated with higher levels of growth, the expected sign of the coefficient of this variable is positive (Esfahani and Ramirez 470-471).

Special Economic Zone (SEZ) is a dummy variable included to account for differences in growth rates among provinces designated as SEZ's and those that are not. SEZ's are coastal cities and provinces selected by the Chinese government as special development areas because of their access to natural resources, labor, ports, etc., and exhibit more business-friendly economic policy than provinces that are not designated as SEZ's (Wang 24-25). It is represented as a dummy variable in the model with a positive expected sign on the coefficient. Lastly, real wage growth and unemployment rate are included to account for the variation among labor markets that may affect provincial income. The expected signs of the coefficients on these two variables are positive and negative, respectively, because higher wage growth leads to higher income, while higher unemployment leads to lower income.

Due to the lack of a true measure of corruption, especially at the provincial level, the model constructed in this paper will use a proxy for corruption following the method of Cole, Elliott, and Zhang (7-8). This proxy for corruption is constructed by measuring the number of registered cases related to corruption per province. Assuming all officials have an equal inclination to commit crimes related to corruption, provinces with a higher number of

convictions are considered less corrupt. This assumption makes sense intuitively because a higher number of convictions indicates a stronger government effort to prevent corruption. Cole, Elliott, and Zhang further note that China's Supreme People's Procuratorate views more convictions of corrupt officials as a province's increased effort in eliminating corruption. The expected sign of the coefficient on corruption prevention effort (*CorruptPrev*) is positive because a stronger corruption prevention effort should lead to higher income.

The Barro framework used to model economic growth in this paper notes the effect of better enforcement of the rule of law. Because the corruption prevention effort variable uses convictions of government officials as its dataset, it captures much of the effect of rule of law on economic growth. Therefore, no other measure of rule of law is included in this model outside of this variable.

The model is run as a time series to capture the effect corruption has on economic growth over time and across provinces[6]. Due to data availability[7], the dataset for this model is the time period from 1998 to 2003. Each province's corruption and economic indicators are compared year over year to test for a correlation between corruption and economic growth over time. Differences in trends from province to province are used to test for the strength of the correlation. If a the data from a few provinces correlate high corruption with low economic growth but the rest reveal the opposite, then this correlation is not very strong. However, if most or all provinces correlate high corruption with low economic growth, then this suggests corruption has a detrimental effect on growth.

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[6] Due to data lack of availability, Tibet was not included in the model.
[7] Data on corruption from the Supreme People's Procuratorate is temporarily unavailable, so the data from Cole, Elliott, and Zhang are used for this model.

Using the variables just discussed, the basic model is as follows:

$$Income_{pt} = f\big(CorruptPrev_{pt}, X_{pt}, \gamma_{pt}\big)$$

where *Income* is total provincial income for a given province p in year t, *CorruptPrev* is the

provincial corruption prevention effort, X is the effect of the Barro framework independent

variables, and γ is the effect of the other control variables. Using this basic model, the final

equation with coefficients for estimating the effect of corruption is:

$$Income_{pt} = \alpha + \beta_1(CorruptPrev_{pt}) + \beta_2(Illitrt_{pt}) + \beta_3(LifeExp_{pt})$$
$$+ \beta_4(PopGrowthrt_{pt}) + \beta_5(GovExpen_{pt}) + \beta_6(\pi_{pt}) + \beta_7(Exp_{pt})$$
$$+ \beta_8(FDI_{pt}) + \beta_9(Pop_{pt}) + \beta_{10}(Area_{pt}) + \beta_{11}(PopExp_{pt}) + \beta_{12}(SEZ_{pt})$$
$$+ \beta_{13}(WageGrowth_{pt}) + \beta_{14}(Unemrt_{pt})$$

The expected signs of each of the coefficients are:

Coefficients	β_1	β_2	β_3	β_4	β_5	β_6	β_7	β_8	β_9	β_{10}	β_{11}	β_{12}	β_{13}	β_{14}
Expected Sign	+	-	+	-	-	-	+	+	-/+	-/+	+	+	+	-

The data are normalized first by putting all data in total terms rather than per capita. FDI, income,

corruption prevention effort, and exports are all measured as totals for each province. Further, all

data are put in RMB using a currency conversion rate of 6.21 RMB per 1 US dollar.

Results

Table 1 shows the coefficient and t-statistic for each of the independent variables. The

null hypothesis for the main test variable, corruption prevention effort, is rejected. The evidence

suggests that provinces doing more to prevent corruption realize higher levels of total income.

Table 2 shows the correlation coefficients of the independent variables. The adjusted r-squared

for the model is 0.96 and is significant at the 99% confidence level based on the Significance F.

Table 1

Variable	Coefficient	t-statistic
CorruptPrev	64095768.82	5.82***
Illitrt	5743289686	6.31***
LifeExp	16612945436	4.61***
PopGrowthrt	-4059524263	-1.57
GovExpen	2.79	4.98***
π	7325177283	2.23**
Exp	0.54	4.97***
FDI	3.08	4.82***
Pop	2625.74	6.51***
Area	37735.46	2.35**
PopExp	236690624.7	0.52
SEZ	51779205208	4.07***
WageGrowthrt	-307681365.4	-0.29
Unemrt	-4804510311	-0.82

**Significant at the 95% level; ***Significant at the 99% level

Of the coefficients on control variables, illiteracy rate, life expectancy, government expenditure, exports, FDI, population, and SEZ were all found to be statistically significant at the 99% confidence level.

The coefficient on the life expectancy variable, as expected, has a positive sign, suggesting higher life expectancy contributes to economic growth. The coefficient on

government expenditure fails to achieve the expected sign. However, using the literature from Barro's research, the positive coefficient on this variable makes sense in this model. Barro's model cites the negative effect "outlays that do not enhance productivity" have on economic growth (18). In this model, total government expenditure is used, which includes both productive and non-productive expenditure. Further, China focuses government expenditure on supporting its export market, certainly a productive outlay. Given the export led economic growth argument, it is possible that government expenditure does not crowd out investment, but rather, helps promote economic growth.

Exports, FDI, and SEZ all reveal positive signs on their coefficients as expected. These three reflect the main drivers of China's economic growth. Population has a positive coefficient, which makes sense given the model's measure of growth: total provincial income. As population rises, total provincial income is expected to rise as well.

Of particular concern is the positive sign for the coefficient on illiteracy rate. This sign suggests that based on this model, higher illiteracy rates contribute to higher provincial income. While this may be explained by assuming people in some of China's higher income provinces forgo schooling to work in manufacturing, it more likely reflects a weakness in the model. Further research would test to correct this discrepancy between the model and traditional economic theory.

Table 2

	CorruptptPre	FDI	Pop	Exp	PopExp p	Area	SEZ	Wage Growt	Unem rt	Illitrt	LifeExp p	PopGr owthr	GovExp	π
π														1
GovExp													1	0.135
PopGr owthr												1	-0.399	-0.151
LifeExp p											1	-0.782	0.477	0.067
Illitrt										1	-0.578	0.518	-0.338	-0.122
Unem rt									1	-0.026	-0.006	-0.067	0.126	0.091
SEZ							1	0.037	0.064	-0.269	0.477	-0.179	0.343	-0.075
Wage Growt								1	0.153	-0.152	0.141	-0.200	0.192	0.109
PopEx p					1	-0.215	0.324	0.085	0.169	-0.288	0.318	-0.021	0.050	0.123
Area						1	-0.078	0.007	0.099	0.125	-0.498	0.341	-0.171	0.080
Exp				1	0.069	-0.179	0.446	0.070	-0.070	-0.202	0.380	-0.124	0.803	0.016
Pop			1	0.326	-0.212	-0.165	0.088	-0.002	0.041	-0.123	0.113	-0.121	0.586	-0.106
FDI		1	0.378	0.869	0.055	-0.257	0.545	0.051	-0.081	-0.187	0.463	-0.237	0.743	-0.021
Corru ptPre	1	0.246	0.865	0.153	-0.128	-0.165	0.115	0.051	0.085	-0.240	0.174	-0.215	0.496	-0.089

Coefficients on inflation rate and area are significant at the 95% confidence level. Although inflation rate was expected to have a negative coefficient based on Barro's model, Barro notes that the negative effects of inflation are much more pronounced when inflation is significantly higher than normal: around 15-20% (68-69). China's inflation rate for most of its provinces fluctuated between -2% and 2%, with some outliers reaching -3% and 3%. This reflects relative price stability and should not negatively affect economic growth. Further, reverse causation could be playing a role here. As economies heat up, inflation is expected to rise. Therefore, the increase in provincial income over time may be causing the increase in the inflation rate.

The explanation of area's positive coefficient follows the same rationale as population: given the dependent variable of total income, larger provinces are expected to have higher incomes. Since a larger geographical province does not necessarily mean that province has a higher population, the explanatory power of this independent variable is weaker than that of population.

Population growth rate, though not statistically significant by traditional measures, is significant at the 88% confidence level, and is worth noting. The negative sign of this coefficient may support Barro's evidence that lower fertility rates contribute to economic growth, because human capital per person is improved (18). Wage growth rate, unemployment rate, and population-weighted expressways were not found to be statistically significant in this model.

To test for the strength of correlation between corruption and income, different trends from province to province were measured. Table 3 shows the results of this regression analysis for each province. Corruption prevention effort was found to be significant at the 99%

confidence level as a determinant of income for all provinces. This indicates strong explanatory power of the independent variable across all provinces.

Table 3

Province	t-statistic*	Province	t-statistic*
Anhui	5.83	Jiangsu	6.03
Beijing	5.78	Jiangxi	6.02
Chongqing	5.72	Jilin	6.04
Fujian	5.76	Liaoning	6.06
Gansu	5.79	Ningxia	6.09
Guangdong	6.01	Qinghai	6.10
Guangxi	6.26	Shaanxi	6.13
Guizhou	6.30	Shandong	5.43
Hainan	6.34	Shanghai	5.63
Hebei	6.16	Shanxi	5.64
Heilongjiang	6.20	Sichuan	5.88
Henan	6.16	Tianjin	5.86
Hubei	6.12	Xinjiang	5.90
Hunan	6.00	Yunnan	5.98
Inner Mongolia	6.03	Zhejiang	5.83

*the t-statistic in this table is for the independent variable corruption prevention effort (*CorruptPrev*)

This model has certain limitations. First, any measurement of corruption is subject to error. This measure in particular captures other determinants of growth such as institutional effectiveness and rule of law. Also, this model does account for all corrupt activity that takes place. Multicollinearity may too be an issue that affects the model specification. This model is designed to control for as many variables that contribute to economic growth as possible. As Table 2 shows, some explanatory variables are highly correlated, such as FDI, SEZ, and exports. Though this correlation is expected, these variables must be included in order to control for their impact on income and isolate the effect of corruption.

As a whole, the model shows strong evidence that when controlling for other determinants of economic growth, provincial corruption prevention effort can have a strong positive impact on growth.

Conclusion and China Moving Forward

Through empirical research, this paper has investigated the impact corruption may have on economic growth in China at the provincial level. Robert Barro's research on the determinants of economic growth was used as a framework to construct a model that controls for these determinants in order to isolate the effect of corruption. This model suggests that corruption has a strong impact on economic growth, and provinces can benefit from cracking down on corruption.

Policy implications suggest that provincial governments can increase the income levels of their province by cracking down on corrupt officials. Based on the coefficients of this model, a 1% increase in corruption prevention effort in the nation as a whole will contribute to a .002% increase in national income. Put in different terms, approximately 390 additional convictions of corrupt officials would increase national income by about 25 RMB billion, or $4.2 billion. To

apply this to a province, take Guangdong, for example. Guangdong, a Special Economic Zone with a population of about 90 million in 2003, has one of the highest total provincial incomes in China. A 1% increase in the corruption prevention effort in Guangdong would result in about 18 more convictions of corrupt officials. The model suggests that this would result in about a 1.2 RMB billion increase in income. Put this in 2015 terms to account for China's increase in output, and the opportunity cost of corruption is even higher. Though simply a reduced model, the real-world implications of fighting corruption cannot be ignored.

Of late, Chinese leadership has taken a strong stance against in a fight against corruption. Former Chinese president Hu Jintao declared corruption "a major political task the Party must attend to at all times" (Bergsten 91). The current Jinping administration has already made a name for itself by cracking down on some of the highest-ranking officials in China. The Chinese Government in Beijing is making what appears to be an effort to eliminate corruption. However, much of the literature on this topic finds the one-party system to be inherently corrupt. After all, the Communist Party of China cracking down on the Communist Party of China seems circular. Some call for democracy, but not everyone finds the multi-party system to be a panacea, as Bergsten notes. The "New Left" of China calls for the state to have an even larger role in corruption. Others believe the state to be the root of corruption (98).

While corruption is a huge issue in China as it transitions economically, China is in a great position from an historical standpoint. Ramirez provides a "life-cycle" of corruption to give context to the corruption discussion. China's level of corruption in the 1990s is much less that of the United States in the 1870s, and is on par with the level of the United States in the 1920s, which had a comparable per capita income to China in 2009 (90). Transparency International finds that China's corruption level has fallen drastically since the 1980s and 90s, though it has

recently plateaued. Ramirez believes that as China modernizes and develops, it may "be in a better position to implement corruption-control reforms" (90). China's social, political, and economic development will allow it to continue to minimize corruption, which, as this paper shows empirically, might contribute to still greater economic growth.

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