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Corruption and Imports

– is China Different?

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Abstract

This Bachelor's Thesis investigates whether China's corruption effects on trade differ from the rest of the world's. The question is raised by the seemingly positive correlation between corruption and imports – in direct contradiction to previous research, concluding the relationship to be negative.

Two Gravity Models are evaluated using Panel EGLS (Cross-section random effects) regressions on data from the year 2003, one of which includes the possibility for non-linear effects. The empirical study includes 48 countries and 6084 bilateral observations.

The results establish, in the investigated sample, that China's corruption effects on imports differ from those of the rest of the world, and that non-linear effects in corruption exist. The non-linearity is probably a so-called "evasion effect".

It is suggested that China's anomalous corruption effects are explained by a high level of predictability within the corruption, its size of bureaucracy and the phenomenon Guanxi.

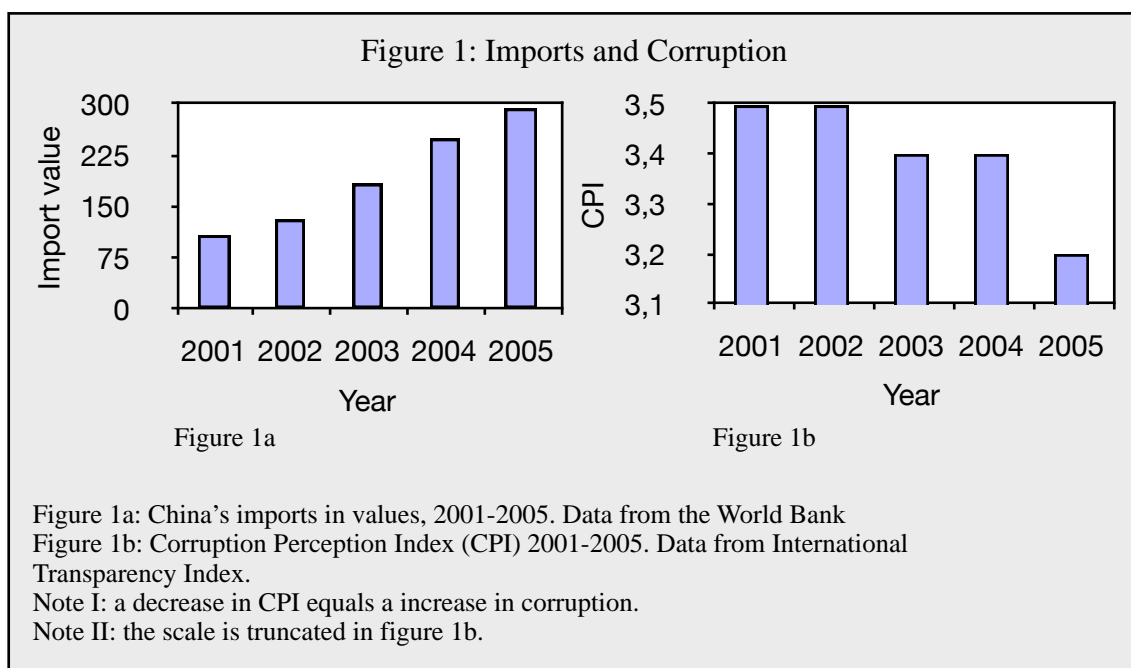
Keywords: corruption, imports, trade, China, predictability, Guanxi, bureaucracy, Gravity Model, non-linearity

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1 Introduction

A common hypothesis in economics research is that corruption discourages international trade (e.g. Ades and Di Tella, 1997; Larraín and Tavares; 1999; Wei Shang-Jon, 2000). The reasoning is that corruption causes increased transaction costs in terms of higher administrative costs and other market inefficiencies. These extra costs, caused by corruption, reduces economic activity such as trade and GDP. This hypothesis is supported by several empirical studies (e.g Bardhan, 1997; He, 2000; Shleifer and Vishny, 2003; Svensson, 2005)

However, China does not seem to follow this pattern. From 2001 to 2005 imports increased, see Figure 1a – it more than doubled in real terms. Based on this observation, it is expected that corruption would have declined, but it has increased as shown in Figure 1b, (which equals a decrease in the Corruption Perception Index (CPI))¹. This observation is in opposition to previous cross-country evidence on corruption.



¹ CPI is defined in an inverted scale, e.g higher corruption means a lower CPI (on a range between 0 and 10).

China seems to have a similar contradiction between corruption and economic growth (GDP). Economic growth is expected theoretically to decrease when transaction costs increase through more corruption (Mauro, 1995; Knack & Keefer, 1995). However, this appears not to be the case for China (Svensson, 2005). China has had a GDP growth of 0.6 trillion US dollars (PPP adjusted) during the period 2001-2005. China's ability to combine growth (and an increase in imports) with an increase in corruption, begs to question whether corruption effects in China differ from those of the rest of the world.

The literature contains little research focusing on China's imports in relation to corruption. Therefore this thesis fills that gap by analysing China's import and corruption, with particular interest given to whether or not China's corruption effects on import differ from the rest of the world's. Based on economic theory (Gravity Model), we estimate the effect of corruption on imports using regression analysis. The data set contains 48 countries and 6084 bilateral observations for the year 2003.

Our empirical results in short: Two Gravity Models have been investigated. We have one basic model for the relationship between imports and corruption and one extended model which also includes the possibility for non-linear effects. The results show that China differs from the rest of the world in its corruption effect on trade, and that non-linear effects exist in this sample. The underlying causes of China's anomalous corruption effects are probably related to a high level of predictability within the corruption, the size of the Chinese bureaucracy and the contextual phenomenon Guanxi.

The rest of the thesis is organised as follows. Section 2 covers corruption and its effect on economic growth and trade. This section includes both corruption theory in general and specifically for China. It also includes related empirical evidence. Section 3

presents the data, empirical analysis and the results. A discussion in section 4 concludes this thesis.

2 Corruption and its effect on growth and trade

2.1 The concept of corruption

A common definition of corruption² is "the misuse of public office for private gain" (Svensson, 2005). By this definition, corruption occurs in the public administration where it is possible to obtain bribes. Therefore, corruption is closely attached to the handling of permissions and licenses. These can be permissions of having bank accounts, certificates, or authorisations for using/importing substances, for instance, toxics. When there is corruption, these are all associated with extra cost, such as bribery and negotiation costs. In addition, corruption increases uncertainty, which raises the need for risk hedging.

There are also costs in terms of misallocated resources. For instance, it might be that a company is focusing on maintaining good relationships with civil servants instead of developing the business itself. Svensson (2005) found that "one percentage point increase in the bribery rate is associated with a reduction in firm growth of three percentage points, an effect that is about three times greater than that of taxation". If it is too difficult to obtain permissions, there is even a risk that private firms give up the business and end up themselves as corrupt bureaucrats. Thus, in general, corruption

² More about how to measure corruption in chapter 3.2

discourages economic efficiency and justice (e.g Bardhan, 1997; Svensson, 2005; He, 2000).

Concerning trade in a corrupt country, civil servants working at the border of the importing country often need to be bribed in order to allow the goods over the border (Meessen, 1995). This will increase trade costs, and at the end of the day those extra costs will have to be paid by the consumer. The implication will be that, *ceteris paribus*, foreign goods will be substituted for domestic goods, since foreign goods will be more expensive. The amount of substitution that will occur is associated with the initial difference in prices. Foreign Direct Investment (FDI) behaves similarly: in a study from 2000, Shang-Jon Wei showed that an increase in either trade taxes or corruption in the host country reduced FDI in the host country. However similar, there are two main components entering in corruption compared to taxes: uncertainty and secrecy.

The level of certainty, or predictability, is a crucial factor for understanding the effects of corruption on a market. If bribes are predictable, then the additional cost can be incorporated into the price in the same way as a tax or other fee. If the level of bribes is uncertain and the operator does not know how many people will have to be bribed, or even worse, if the operator cannot be sure to obtain a permission even after paying the bribes, it is impossible for the operator to predict the cost of being in that market.

The element of secrecy is due to the illicit nature of corruption. A great amount of effort is needed to keep the bribe collections secret, which results in efficiency losses (Shleifer and Vishny, 1993).

These elements require negotiations between partners, which takes extra time and resources. Long negotiations can result in rotten vegetables at the border and/or other wasted goods. This squandering can be likened with red tape, but with the extra intention of self interest in earning money. Thus, corruption harms trade by increasing trade costs, both in terms of bribes and of misallocated resources.

2.2 Corruption Theory

In order to determine the level of corruption (CPI for instance), general corruption research has focused on weak versus strong governmental institutions, which in turn has been shown to affect economic activity; a higher level of corruption causes less economic activity (e.g. Knack & Keefer, 1995; Broadman and Recanting, 2001). This theory is not consistent with empirical studies from all countries, therefore during the 1990's it was complemented by several new theories. Theories by Vishny, Shleifer and Bardhan will be presented in this section, and later applied to the context of China in the concluding discussion section. Hopefully, these theories will provide an indication of why China's corruption effects appear to be different from those of the rest of the world, regardless of what the empirical study shows.

Predictability

Bardhan has paid a lot of attention to the phenomenon of predictability in corruption (e.g. Bardhan 1997, 1999, 2005). He, and his co-researchers Campos and Lien (1999), observed that some East Asian countries, China among others, did very well in terms of economic growth. At the same time, they did very poorly in terms of clean institutions,

meaning high level of corruption (low CPI). Bardhan et al. attempted to find variables that could explain why the countries behaved so differently in their corruption effects. They argue that informal institutions are central to the analysis; there exist different corruption regimes with different corruption effects. It is not only the level of corruption that matters, the level of predictability is important as well. They created two variables in order to capture what they thought would be the difference, namely the level of predictability in the corruption. Their research showed strong results for the new variables. Based on the predictability measured by these variables, a country can be inferred to belong to one out of three corruption regimes suggested by Bardhan et al. (1999).

The first regime consists of countries with a high level of corruption, low level of predictability and with only moderate to no economic growth. The second regime is comprised of countries with both high levels of corruption and predictability, and a high level of economic growth. The third regime has a low level of corruption, high level of predictability and high economic standard. Those in the first regime are developing countries with low economic standard. Those in the third regime are developed countries. The countries in the second regime are those that fall outside of the conventional research expectation of a negative correlation between corruption and economic growth. They can be explained however by their high level of predictability (1999).

The Governmental organisation

We have discussed the importance of predictability. Now we will investigate the underlying causes. Shleifer and Vishny state that the level of predictability can be understood by analysing the governmental organisation in a country; “how the corruption network is organised” (Shleifer and Vishny, 1993). They make a distinction between centralised and decentralised government. This distinction has shown to be very important when considering the fact that an operator needs more than one permission in order to be able to do business or trade.

The following is the basis of their theory. There are three identifiable schematic situations with different positions that a government (or a dominating mafia or equivalent) can possess. The first situation is when a government is strong and centralised enough to possess the power to control the corruption by one superior body. Even though several bodies have to be bribed, there is one superior authority that regulates the bribe collection. The operator can be sure of receiving the service and no additional payments will be required. This is true since the government has the power to penalise individuals for not sticking to the “rules” of bribes. The government is concerned with looking after its civil servants since the price is designed to maximise the total bribe collection. Since the provided services and goods are complements, the bribe for one service affects the possibility of collecting a bribe for another service, due to the operator’s budget constraint (Shleifer and Vishny, 1993).

In the situation outlined, the government possesses a monopoly position. This situation of having one monopoly for all services is often taken for granted in corruption research. Shleifer and Vishny provide two more possible situations in an attempt to shed more light on the causes of corruption effects.

In the second situation they describe, the government is decentralised and therefore the operator needs to bribe several authorities in order to accomplish the economic activity. No coordinating superior authority exists. Civil servants in different departments act independently and possess a monopoly of power over their specific service or good. This means that the civil servants will maximise their own bribe profit for every single good and service.

The third situation is when several departments require bribes but with the crucial difference that the bribe collectors do not hold a monopoly position. This gives the operator freedom to choose another supplier if she is asked for bribes. In this case, competition will drive bribes down to zero, assuming no collision between suppliers.

These three situations affect not only the level of corruption but also the total revenue of bribes collected. The level of bribes for single services or goods will be highest in the second situation, where the bribes are maximised for all goods and services. That, in combination with uncertainty of receiving the paid service, leads to less demand for those goods and services compared to situation one, where the level of corruption is lower due to the superior coordinator. The total revenue of bribes will however be the highest in situation one, since more operators can afford and dare to be on the market (Shleifer and Vishny, 1993). Thus, uncertainty in the market combined with bribe maximising, will reduce demand for governmental goods and services, which in turn leads to less economic activity.

An overall high level of corruption does not in itself necessarily have to be harmful to economic activity; in fact, maximising the total amount of bribe revenues can enable predictability, which in turn encourages economic activity. The best case scenario for economic activity is when the third situation prevails, i.e. when there is no corruption. The next best is the first situation, where corruption exists but with one superior monitor. The worst is the second situation, i.e. decentralised and fragmented bribe collection with no monitor (Shleifer and Vishny, 1993).

Bardhan's theory of predictability as well as Shleifer and Vishny's theory of the network of corruption have been validated in other studies (e.g. Thede and Gustafson, 2012).

2.3 Related empirical evidence

A negative relationship

Previous research on corruption and openness (import, export and FDI) shows a negative relationship (Larraín and Tavares, 1999; Wei, 2000; Gokcekus and Knörich 2006). Larraín and Tavares (1999) studied the openness and corruption that occurred in the world during the period 1980 to 1995. They determined that a causal relationship exists between these two variables, where increased openness causes a reduction in corruption. One of their findings, which is of particular interest for this thesis, is that imports (as a share of GDP) not only seemed to be negatively correlated with corruption, but according to the results of the robust test were strongly negatively correlated (1999). Gokcekus and Knörich (2006) studied the same relationship, openness and corruption, but with the opposite causality. They too found a significant robust causality. Therefore we can conclude that causality occurs in both directions.

What is most important however is that the existence of a negative relationship between corruption and trade has been validated.

Non-linearity

In contradiction to the validated negative correlation between trade and corruption throughout the world, results from complementary studies in the field suggest that the effects of corruption are context specific. Therefore they are neither always linear nor equally impeding trade. Bardhan, among others, states that corruption can actually increase market efficiency. One example would be a country which initially has arduous bureaucracy. In such cases, corruption can enable the creation of black market businesses and therefore increase economic growth (1997; Leff, 1964; Huntington, 1968). In trade terms, corruption can speed up administration at the border and thus decrease border transaction costs. Whether corruption will slow down or speed up administration is determined by both the country's size of bureaucracy and its organisation. Investigation of this, in relation to China, will follow. For the moment, we just notice that China has a large sized bureaucracy and is therefore expected to benefit from corruption.

Méndez and Fecund (2006) have found that for free countries³ to reach the highest possible economic growth, the level of corruption should be significantly greater than zero. Another study, by Halkos and Tzeremes (2010), found a u-shaped relationship between corruption and economic efficiency. These two findings indicate ambiguity in the linearity of corruption effects. Therefore this thesis will investigate whether or not non-linear effects in the CPI exist. A simulation of the estimated parameter on CPI and its effect on trade will also be included.

³ In order to classify countries as "free" or "not-free", Méndez and Fecund have used the index of freedom from Freedom House International.

Svensson (2005) asserts that corruption harms imports, with a statistical significance at the one percent level. However China does not appear to fit this pattern. Svensson sums up by asking, “Is corruption less harmful in China? Or would China have grown even faster if the level of corruption was lower?” (2005, pp 40). Unfortunately, Svensson provides no answers to these questions. Still, he highlights the confusion around China’s corruption effects. Do they differ from those of the rest of the world? If so, how can this case be explained?

2.4 Corruption in China

The extent of corruption in China increased after 1978, when the first reforms of liberalisation began. The sharp increase continued until 1995 when a small reduction is noticeable (He, 2000). Corruption is generally expected to increase in times of transition towards market economy, and then to later decrease below the initial level of corruption. The decrease is due to increased market competition and democracy improvements such as increased transparency and political competition (Bardhan, 1997).

China’s increase in corruption is thus expected. What is not expected is that China’s high level of corruption does not seem to affect trade. In comparison to Russia, China is superior in both economic growth and in trade, even though both countries are post communist and in transition (Larsson, 2006).

Market transition

Countries in economic or political transition often experience an increased level of corruption due to decentralisation. However, in the long run, corruption will decrease due to increased political competition in terms of elections, as well as a larger number

of suppliers of public services (Svensson, 2005). Owing to the lingering nature of corruption, high levels of corruption still remain in many countries that underwent transition in the 1980's. China, Eastern Europe and the Soviet Union all experienced similar economic transitions, but there was one crucial difference: Eastern Europe and the Soviet Union adapted to the western-style democracy model of political governance, while China remained communist accompanied by a strong state. China's transition towards market economy has been characterised by gradual changes through many reforms (Nee, 1992).

Guanxi and corruption equilibria

In the Chinese culture there exists a phenomenon familiar to all Chinese. It is termed Guanxi and can be translated to "relationship", however it has a much broader meaning. It can be described as a multidimensional social network for bartering of favours, primarily motivated by self-interest but also concerns taking care of each other on the basis of shared moral and ethical values (Guo, 2001).

Four dimensions of Guanxi exist: instrumental, etiquette, moral and emotional. The instrumental dimension is the most dominant and is concerned with strategic actions aimed to obtain benefits for oneself. It is about calculating rational choices with the motive of one day gaining back. At times it is been referred to as an "exchange relationship" (Guo, 2001). The definition of the instrumental dimension is close to the common definition of corruption: the misuse of public office for private gain (Svensson, 2005).

The etiquette dimension is concerned with creating harmony in a group of people; the obligation of helping someone when possible. Essentially, this dimension is driven not by self-interest but rather by a desire to create smoothness and harmony within the social network.

The moral dimension refers to feeling responsibility for each other and caring for the network of guanxi relationships. It could concern helping people from the same village or kinship. The final dimension, the emotional, is based on strong friendships and the desire to help each other. The four dimensions cooperate dynamically, therefore one action usually includes more than one dimension. Consequently, it is difficult to separate actions of Guanxi from those of corruption.

The phenomenon Guanxi is a result of thousand years of belief in the ideational tradition of Confucianism. One component in Confucianism is to honour the family. During the cultural revolution, the phenomenon emerged stronger and became prominent in Chinese politics as well as in business life (e.g. Wong, 2007). It is well-known that, in the 1930's, Guo Mao Zudong and Zhang Guotao helped each other to obtain power (Guo, 2001). In the post Mao era, and still nowadays, Guanxi creates trust where the state is lacking in social stability and predictability (Guo, 2001; De Sousa Santos, 2002). As described through the four dimensions of Guanxi, Guanxi is not necessarily equivalent to corruption. It can also be a legal action such as someone using a favourable position to help their family.

Luo (2008) has noticed a change in Guanxi, what he describes as a "de-moralisation" in the modern Chinese culture. He claims that the moral and ethical dimensions, which are

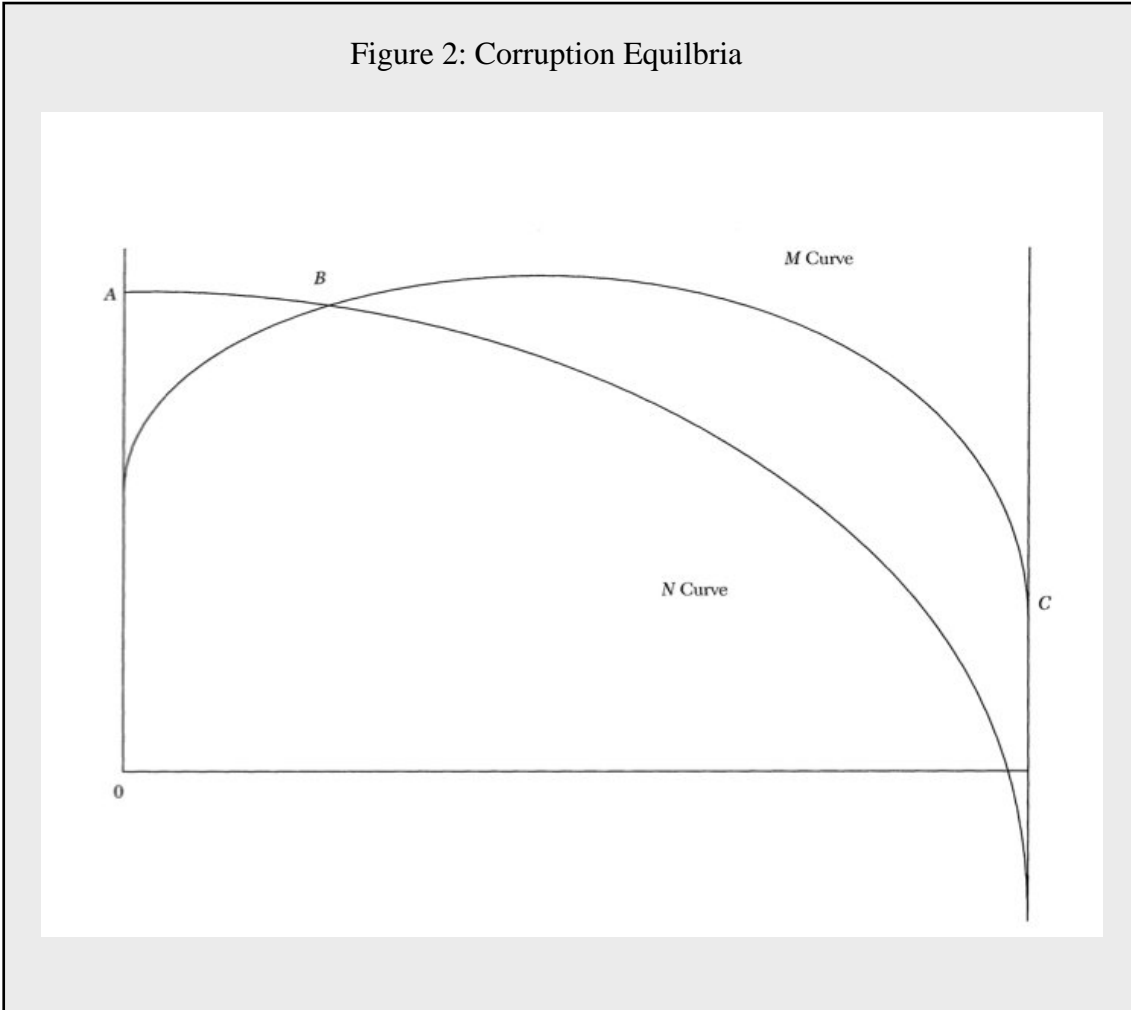
based on Confucian ideas, are fading and that the instrumental dimension is becoming more prevalent. He claims that this development is clearing the way for a boost of selfishness and instrumental calculation under the name of Guanxi (Luo, 2008). As the instrumental dimension is closely resembling corruption, this implies that what is defined as corruption will increase in the future.

To sum up, Guanxi includes both the intention to help family and the will to obtain benefits for the person itself. The underlying reason is the lack of predictability within the state organisation, which gives people incentives to network in order to be able to push through bureaucracy. Guanxi can in such circumstances contribute with more predictability. And in turn, if it succeeds in overcoming bureaucracy, economic activity could increase (Bardhan 1997; Leff 1964; Huntington 1968).

Many attempts to combat corruption, in China as well as in many other parts of the world, have ended up unsuccessful or with only modest progress. The reason is corruption equilibria. The equilibria that emerge are due to the trade off between the benefits of being corrupt and the risks of being corrupt. Regardless of where the equilibria end up, it is always harmful to be outside them (e.g Bond, 2008; Blackburn and Sarmah, 2008).

Figure 2 shows an illustration of corruption equilibria (Bardhan, 1997). The cost of being corrupt is on the y-axis and the level of corruption is on the x-axis. The M curve measures the benefits of corruption and N the costs.

Figure 2: Corruption Equilibria



At point *A* no one is corrupt, at point *B* some are corrupt and at point *C* everybody is corrupt. The *N* curve will be higher if a person is between *A* and *B*, which means that the marginal benefit of being honest exceeds the marginal benefit of being corrupt (represented by the *M* curve). Therefore, a person to the left of *B* will act honestly. On the other hand, if a person is between *B* and *C* then *M* is the highest curve and therefore the person will make personal losses by being honest as well as complicate daily work procedures. This person will gradually move to *C* and end up by being totally corrupt. This implicates that *B* is not a stable equilibrium while *A* and *C* are. A little movement to the right or left leads to either situation *A* or *C*, and since corruption is not transparent

and therefore one actor does not know what the other is doing, it is impossible to stay in the point *B*.

This model demonstrates the importance of a country's initial situation but also the dilemma of individual actors. Even though a person may want to act honestly, the economic incitements work in the opposite direction if the rest of the organisation, community or state is corrupt. The model also visualises how difficult it is for an honest trader to find an honest trade partner in a corrupt country. Not many people are willing to act outside the prevailing equilibrium. The resulting increase in search costs raises trade costs.

Li emphasises the micro-level impact of Guanxi. Li claims that the social control of both expectations and social codes of conduct can be powerful enough to "remove the legal, moral and cognitive barriers (...)" (2010, pp 1). One could therefore imagine that corrupt civil servants and other actors in the Chinese economy are more likely to end up in a corrupt equilibrium, since both money and strong social norms are at stake.

Recognised corruption-combating strategies aim to increase transparency and reduce the state's role. However, although China's government has engaged in several actions to curb corruption, and many more will be launched (He, 2000), they have not been, and probably will not be, done in the conventional way, which includes more power to the market and less to the state. Pearson puts it this way: "The question surrounding the governance of China's markets, then, is not whether the government will remain involved but, rather, what form the new 'regulatory state' will take" (2005, pp 296).

3 Empirical analysis

3.1 The Gravity Model

The most validated way of measuring bilateral trade flows is the Gravity Model (e.g. Andersson, 1979). The model has its basis in Newton's "Law of Universal Gravitation" from 1687, which models the force between two massive bodies. This force is represented by the following equation:

$$F_{ij} = G \frac{M_i M_j}{D_{ij}} \quad , \quad (\text{Eq. 1})$$

where F_{ij} is the attractive force, G is the gravity constant, M_i and M_j are the two masses and D_{ij} is the distance between the two bodies.

In the Trade Gravity Model, F measures the trade flow between two countries. This model makes it possible both to estimate trade flow changes, due to specific variables such as political decisions, and to estimate a variable's importance in relation to the trade flow. Tinbergen (1962) was the first to use the model in an economic context. Since then, many economists have theoretically validated the model (e.g Anderson, 1979; Anderson and Wincoop, 2003; Bergstrand 1985 and 1989). Anderson (1979 pp 1) declares that the gravity equation is "probably the most successful empirical trade device of the last twenty-five years".

The standard Trade Gravity Model includes standard control variables in order to control for the relationship between trade flows and the independent variable. Another standard procedure is to use imports for measuring trade flows. This is a convention in order to avoid undesired extra dimensions, which could be the case when measuring a broader observable, such as openness or net trade. In order to facilitate the use of the model with many variables, the model is often converted into a logarithmic equation. We will follow this standard modelling.

The purpose of this thesis is to investigate whether China's corruption effects differ from the rest of the world's. In order to do so, both a dummy variable of China's CPI and a general CPI variable are added to the model.

Model 1 is the initial model while Model 2 has an additional variable: CPI squared. There are two main reasons for adding CPI squared. First, it is likely that non-linear effects exist in corruption (Halkos and Tzeremes, 2010; Dutt and Traca, 2010), specifically that the derivative of the corruption index changes with the level of corruption (a threshold effect). The second is that CPI adopts a value between 0 and 10, however it can econometrically continue lower or higher. Negative values are then avoided by the square. In practice, the only difference between the models is the squared parameter: β_{12} ; in Model 1, $\beta_{12} = 0$ and in Model 2, β_{12} is a free parameter.

The equation is:

$$\begin{aligned} \ln(\text{IMP value}_{ij}) = & \beta_0 + \beta_1 \ln(G_i) + \beta_2 \ln(G_j) + \beta_3 \ln(GP_i) + \beta_4 \ln(GP_j) + \\ & \beta_5 \ln(IT_i) + \beta_6 (SB_{ij}) + \beta_7 (CH_{ij}) + \beta_8 (SL_{ij}) + \beta_9 \ln(D_{ij}) + \beta_{10} (C_i) + \\ & \beta_{11} (C_i |_{i=c}) + \beta_{12} (C^2) + \varepsilon_{ij}, \end{aligned} \quad (\text{Eq. 2})$$

where IMP value_{ij} is the import value between countries i and j . β ($n = 0, 1, \dots, 12$) are the parameters and ε_{ij} a residual. Variables: index i always denotes the importing country – exchange i for j to represent the exporting country. G_i stands for GDP and GP_i is GDP per capita. IT_i is the importing taxes for all goods in measured values, i.e. ad valorem equivalent tax. SB_{ij} is a dummy variable which captures whether the importing and exporting country share a border. CH_{ij} is also a dummy variable capturing whether the importing and exporting country have ever had a colonial link, and SL_{ij} , a dummy variable too, captures whether they share a common official language or not. D_{ij} is the physical distance between the importing and exporting country. The distances are calculated following the great circle formula, which uses latitudes and longitudes of the most important cities/agglomerations (in terms of population). C is the variable that measures corruption, Corruption Perception Index (CPI). CPI is defined in an inverted scale, e.g higher corruption means a lower CPI (on a range between 0 and 10). $C_i |_{i=c}$ is a dummy variable which captures China's CPI. Expected behaviour of the parameters is presented below in Table 1.

Coefficient	Variable	Full variable description	Expected behaviour on trade flows	Explanation of the expected behaviour on trade flows
β_1	G_i	GDP for import country	Increase	High GDP implies a strong demand for goods; demand for trade increases
β_2	G_j	GDP for export country	Increase	High GDP implies a strong demand for trade
β_3	GP_i	GDP per capita importing country	Increase	Consumption effect: a higher GDP per capita gives a higher demand for goods and in turn a higher demand for trade.
β_4	GP_j	GDP per capita exporting country	Increase	Consumption effect: a higher GDP per capita gives a higher demand for trade.
β_5	IT_i	Import taxes	Decrease	High import tariffs imply high trade cost which in turn makes the good more expensive. That will reduce the demand for that good.
β_6	SB_{ij}	Sharing a border (dummy)	Increase	If two countries share a border, they will be relieved from paying customs duties to countries outside the bilateral trade situation. Trade cost decreases which implies a stronger demand for the good.
β_7	CH_{ij}	Colony heritage (dummy)	Increase	Similar infrastructure and links through culture heritage encourage trade.
β_8	SL_{ij}	Sharing an official language (dummy)	Increase	Facilitate trade exchanges.
β_9	D_{ij}	The physical distance between the two countries	Decrease	Due to transport cost, trade decreases with distance.
β_{10}	C_i	CPI for all countries	Increase	Previous research shows that corruption is a transaction cost and is therefore expected to reduce trade.
β_{11}	$C_{i c}$	CPI for China (dummy)	-	-
β_{12}	C^2	CPI squared	-	-

Table 1. Variables used in the model.

The internal economic size is a central determinant of how much a country demands to trade. China has experienced rapid growth in recent decades and so has its trade. However, there is no need to analyse this development separately. The economic size will be captured by GDP and GDP per capita. GDP is the economic mass of a country – its power to consume. GDP per capita is a measure of a country's level of development. Therefore China's economic size is included in the model.

China joined the World Trade Organisation (WTO) in 2001. The basis of WTO is the Most Favoured Nation (MFN) rule, the non discrimination rule and the commitment of reciprocity concerning trade barriers. These rules (and others) encourage trade and reduce trade cost, which in turn leads to more trade. Empirical evidence for this can be found in Chang and Lee's paper "The WTO Trade Effect" (2009). It would therefore be assumed that China's trade volumes would have increased after 2001. However, since trade taxes function as a mirror of WTO effects, it is unnecessary to incorporate WTO membership as a variable.

Researchers have found strong evidence for dual-causality between openness (e.g. trade) and corruption – corruption affects trade and trade affects corruption. The basis of this thesis is an investigation of corruption effects on trade given a certain level of corruption, however causality will not be determined – only correlations⁴.

⁴ The empirical results will not inform us as to whether or not corruption has been affected by increased imports, or vice versa. Causality could be empirically analysed through the use of instrument variable analysis, however that is beyond the scope of this thesis.

3.2 Data description

Measuring corruption

Several measurement indices define economic corruption similarly. One of them, the International Country Risk Guide (ICRG), is the “only agency to provide detailed and consistent monthly data over an extended period for a large number of countries” (Hoti and McAleer, 2004). Another, the Corruption Perception Index (CPI), is an index based on politicians’ and public officials’ perceptions of corruption in their countries. It represents a “poll of polls”, which is a weighted index, compiled from up to 11 different surveys of businessmen, country experts and local populations. A third index, Control of Corruption, is an extension of the CPI that uses both a wider definition and more data sources. CPI is used for this thesis, however all of the corruption indices mentioned are highly correlated (Svensson, 2005).

Each of the prevailing indices has endured criticism (e.g. Ko and Samajdar, 2010). Critics claim that it is improper to use proxies to measure the differences between countries' contexts (economic circumstances such as e.g. GDP and governance). One approach is to try and adjust for these differences, but they might be difficult to define. Considering that, once the adjustments for context have been made, the comparison between countries requires some care. Transparency International, the originator of the CPI, also advises caution when comparing CPI from one year to another. This is mainly because of changes in surveys and attitudes towards corruption (Transparency 2011-11-25). Considering this difficulty, we have chosen to study data from one year only. The choice of year will be discussed in detail later.

The CPI likely has minimal measurement errors in comparison to the other indices because it is based on actual perception and not expected levels of corruption. CPI is the most widely disseminated among policymakers (Svensson, 2005) and is well-used in research on corruption (e.g Paldam 2002; Beets 2005), which allows for comparison between papers. CPI's definition of corruption is "the misuse of public power for private benefit" (in great similitude to the common definition⁵). The term 'misuse' refers to breaking a law. In CPI, corruption includes kickbacks, bribery and embezzlement of public funds (Transparency international 2011-11-14). The definition states that corruption is about public administration abuses and not, for instance, bribes between privately owned enterprises. Bribes and other illicit actions between privately owned enterprises can certainly affect trade and other economic activities. However, public administration benefits from a unique position since it doesn't need to make profit and often has a monopolistic position.

Other variables

The range of CPI is between 0 and 10, where 10 is the least corrupt institutions and 0 is the most corrupt. Consequently, a positive correlation in the regression output signifies a negative relationship between corruption and imports.

⁵ which is "the misuse of public office for private gain" (Svensson, 2005)

In order to be able to measure corruption, some assumptions are necessary. We will assume that⁶:

- I. Corruption can be measured. Limitations in the CPI measure admittedly exist but will be brought up for discussion when necessary.
- II. Corruption can be compared between countries. This requires an understanding of contextual differences. To this end, further analysis of the Chinese context is needed and will be presented.
- III. The level of corruption is the same at the border of the country, as in the mainland area of the country. This assumption is not entirely consistent with reality, but is necessary in order to investigate trade flows in relation to corruption, due to the lack of specific border data on corruption.

The empirical analysis is limited to data from 2003, due to the recommendation from Transparency International to be restrictive when comparing CPI over time and due to space shortage. The year 2003 is chosen for two main reasons. The first is China's WTO entry in 2001. It is plausible that this year includes transition elements and therefore lacks representative data of the year. The year 2002 will not be used since it in turn may possess lagged unrepresentative data due to the WTO membership entry. Secondly, 2003 is well centred within the interesting period, and is in that respect likely to be representative of the overall behaviour.

⁶ The assumptions are widely recognised (e.g. Torrez, Jimmy 2002)

All countries in the world with available data for all variables are included. The data set includes 48 countries and 6084 bilateral observations⁷.

To obtain reliable data, we use external sources such as the World Bank⁸. Since both GDP and trade data are collected by national authorities, it is reasonable to remain sceptical, especially when analysing a corrupt country. In such countries, a measurement bias exists in that reported trade flows are likely to differ from actual trade flows (De Jong and Bogmans, 2010). In the case of China, statistics are known to be widely manipulated (Rawski, 2001). However, the data for this thesis have been carefully chosen. The GDP data (in PPP adjusted US dollars) are from the World Bank, a highly trusted source. Their data are frequently used in economic research. The trade data, reported in thousands of US dollar, are from the World Integrated Trade Solutions (WITS) – more specifically, from TRAINS, an organisation maintained by the UNCTAD which is also part of the World Bank. WITS data are widely used in trade policy negotiations and generally accepted as a reliable source. The data on common border, colonial heritage, language and distance are from CEPII, a known institute for research in international economics.

⁷ Since the model is expressed in logarithms, we will lose observations where import taxes equal 0, because $\ln(0)$ is not mathematically defined. In order to avoid this problem, it is common to use different econometrical methods. The Heckman Model is one of the most recognised (Helpman, Melitz and Rubinstein, 2008). Unfortunately, this method is beyond the scope of this thesis. In order not to lose observations, import taxes equal to 0 are set to 10^{-11} .

⁸ All data sources are listed and specified at the end of Section 4.

3.3 Results

Model 1 and Model 2 are applied to the data using a random effect estimator⁹. Both models are corrected for heteroskedasticity through Whites Robust Standard Errors. No autocorrelation is found, as expected. Table 2 shows the parameter estimates from the regression analyses. Interpretation under the table.

⁹ The model is estimated in e-views 7 by a Panel EGLS (Cross-section random effects) regression with the *Swamy and Arora estimator*

Dependent variable: Imports.

Variables	Model 1 Estimated β parameters (p-value is reported in parentheses next to the parameter estimate)	Model 2 Estimated β parameters (p-value is reported in parentheses next to the parameter estimate)
Observations	6084	6084
Constant	-30.715 *** (0.0000)	-31.325 (0.2205)
GDP per capita EXP country	0.058 ** (0.0331)	0.061 ** (0.0264)
GDP per capita IMP country	-0.122 (0.3124)	-0.178 (0.1760)
GDP EXP. country	1.194 *** (0.0000)	1.222 *** (0.0000)
GDP IMP. country	0.848 *** (0.0000)	0.863 *** (0.0000)
Import tax (ad valorem equivalent)	0.027 ** (0.0000)	-0.011 * (0.0732)
Dummy variable: sharing of border	0.909 *** (0.0000)	0.910 *** (0.0000)
Dummy variable: colony heritage	0.254 (0.5068)	0.250 (0.5075)
Dummy variable: language	0.853 *** (0.0000)	0.835 *** (0.0000)
Distance	-1.343 *** (0.0000)	-1.342 *** (0.0000)
CPI index for all included countries	0.841 ** (0.0127)	0.410 (0.1116)
Dummy variable: China's CPI index	0.219 (0.2915)	0.064 (0.3237)
(CPI) ²	-	-0.023 (0.2205)
Durbin-Watson	1.824	1.830
F-statistic	954.510	864.190
Jarque-Bera	1041.625	1165.533
Adjusted R ²	0.633	0.630

Table 2. CPI gives values between 0 and 10, with a higher score indicating less corruption.

* significance at 10 percent level ** significance at 5 percent level *** significance at 1 percent level

The explanatory power is relatively high in both models, with an adjusted R^2 of approximately 0.63. We will now discuss the control variables, and then turn our attention to the CPI variables.

GDP per capita of the exporting country has a positive effect in both models, with a parameter estimate significance of five percent. The GDP per capita of the importing country is not significant for any of the models; this parameter is unable to tell us whether an increase in the importing country's GDP per capita will lead to more or less demand for imports. This result however is recognised to vary between studies and does therefore not disturb the model. The parameter estimate, in both models, for GDP of both the exporting and importing country is positive, with a significance at the one percent level. This strong result indicates that GDP is an important determinant of trade flows.

In Model 1, import tax does not follow the expected negative correlation. Instead, the parameter estimate is positive, with a significance of five percent. This is not a plausible result, since trade should not increase when import taxes, and thus trade costs increase. Therefore, we interpret this result as an error in the model. In Model 2, where the CPI square is added, the parameter estimate for import tax is now negatively significant on a ten percent level. This result is more likely, which strengthens Model 2. We will return to this variable in the discussion of the CPI variables.

All of the control variables (sharing a border, colony heritage, language and distance) of the bilateral relationship between countries have significant parameter estimates at the one percent level, except for one variable: colony heritage. Colony heritage is positively significant only at a ten percent level in Model 1, while insignificant in Model 2. The

results indicate that, overall, the relationship between countries and common features shared among them are important for trade. With respect to this sample, however, colony heritage is practically unimportant. Considering that this sample is collected on a world basis, the lack of significance is not a problem. On the contrary this can be understood, as most former colonies are becoming more independent. Still, if the same empirical study were to include only former colonised and coloniser countries, one would expect the result to be positively significant.

The parameter estimate for CPI with all included countries, is significant at the 5 percent level (p-value of 0.0127) in the first model, and almost significant (p-value of 0.1116) in the second. Thus, corruption appears to discourage international trade. The variable with the function to capture China's corruption effects on trade, China's CPI, is insignificant in both models. The implication is therefore that corruption in China does not affect its imports. The conclusion from these results is that the corruption effects on trade do differ for China compared to the rest of the world in Model 1. Model 2 does not give a strong answer, although, from the almost significant dependence on the world's CPI, it indicates that trade in China indeed responds differently in this respect. The uncertainty in the CPI parameter estimate in Model 2 are not well understood, but imply that general inference cannot be made on this sample.

We will now pay closer attention to the differences of the two models. Adding CPI squared into Model 2, has two main consequences: the first is that the parameter estimate for import taxes becomes negative, as mentioned earlier, which gives strength to Model 2. The positive sign in Model 1 is surprising, since we expect a negative relationship between trade and corruption on a world basis, according to previous

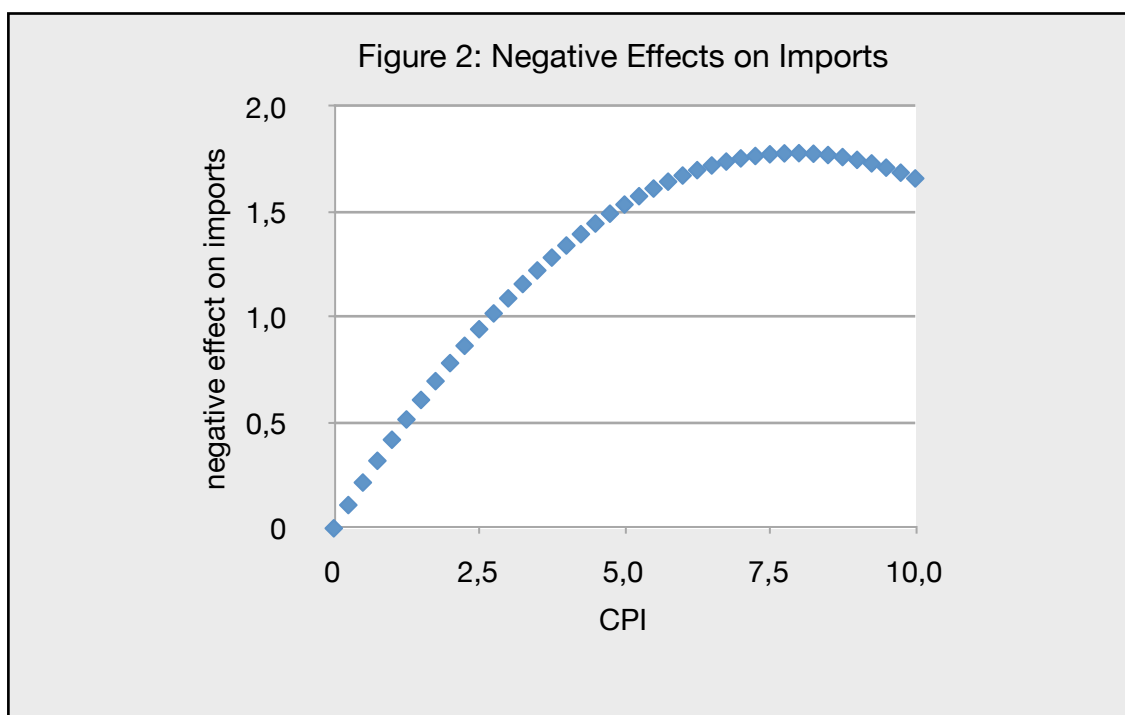
research. The second is that the CPI variable for all countries changes from being significant at a 5 percent level to being insignificant, although still almost significant. A third, smaller consequence is that Adjusted R^2 is slightly decreased, from 0.633 to 0.630. The model, in its entirety, becomes a little weaker with the added CPI², which argues against Model 2. However, the change in the adjusted R^2 is very small.

The change of sign on the parameter estimates for import taxes, could possibly be understood in the light of Dutt and Traca's (2010) theory of non-linearity in corruption caused by different levels of import taxes. The theory in short: when trade taxes are low, corruption will reduce trade because of increased transaction costs. This is called *extortion effect*. On the other hand, when trade taxes are high, the incentive to avoid trade taxes increases and corruption becomes more attractive. In such cases, goods are imported under the label of another good with a lower import tax – the taxes registered at WTO will in such case differ from the true ones. Since corruption costs are smaller than trade taxes, the lower transaction costs allows trade to increase, i.e. the so-called *evasion effect* is dominant. (Dutt and Traca, 2010). Specifically looking at China's trade, it has been found that China does mislabel imports (reporting imports in a lower-tax category) (Fisman and Wei, 2004).

This theory can possibly explain the counter-intuitive negative parameter estimate on import taxes in Model 1¹⁰. The explanation why Model 1 shows a positive relationship between import and import taxes, would be that a linear model is forced to fit to non-linear data. When the impact of CPI is not allowed to vary in a non-linear manner, the (unreasonable) parameter for import taxes is possibly capturing the corruption effect, i.e. the evasion effect.

¹⁰ This relationship could be tested, which we encourage.

Though no inference can be made from this parameter (CPI^2 has a p-value of 0.2205) the evidence of non-linearity in this sample is still worth attention. The non-linear effect of CPI in Model 2 is illustrated in Figure 2. It has been constructed using parameters from Table 2. The corruption index is on the x-axis and the import effect is on the y-axis.^{11 12}



As seen in Figure 2, a small change in the level of corruption gives a big change in the trade corruption effects in a low CPI country, until CPI around 5. Corruption effects are at their strongest at a CPI around 7.5, while at the same time insensitive for CPI changes. After this maximum, corruption effects will decrease, and sensitivity will increase again.

¹¹ The Y axis is in logarithms and therefore in arbitrary units, only the relative values are of interest.

¹² The simulation is of the form $\ln(\text{import effect}) = C + \beta_{10} CPI + \beta_{12} CPI^2$, where C is a constant (all other variables are fixed), β_{10} is the CPI parameter and β_{12} the CPI squared parameter. Using the parameter estimates from the regression, and setting C arbitrarily to zero, we obtain:
 $\ln(\text{import effect}) = 0,410235CPI - 0,02335CPI^2$

The interpretation of this behaviour is that low CPI countries are more sensitive to a change in CPI. It is interesting to note, that here a change towards lower corruption (higher CPI) has a negative effect on imports. One possible explanation is, that these are all developing countries, which generally have high import taxes. Decreasing corruption, maintaining the same level of import taxes (which is indeed kept constant in this simulation), would result in trade hampering effects. It would simply increase transaction costs.

This simulation fulfils its purpose of showing the pattern of non-linearity. However due to multicollinearity, if one would like to go further with the simulation, it is necessary to take the correlation into account.

Sources of estimate uncertainties

The residuals of the data sample do not follow a Gaussian distribution¹³. Although the overall pattern follows a Gaussian distribution, a few extreme outliers weaken the result.

Another plausible cause for the insignificant result is the existence of multicollinearity in the model (see Appendix 1 for the complete correlation matrix). In this sample, two pairs of variables are highly correlated within the model. The first pair, GDP per capita for the importing country and CPI index for all the importing countries, is expected to correlate since high income countries tend to have lower corruption. This pair has a correlation coefficient of 0.88. The second, GDP per capita for the importing country and GDP for the importing country, has a correlation coefficient of 0.58.

¹³ This can probably be remedied by using instrument variable analysis and bootstrapping, however that is beyond the scope of this thesis.

Multicollinearity is not necessarily an indicator of failures of the model. GDP and GDP per capita are expected to correlate. To some extent they measure the same thing, for an evenly distributed increase in GDP over the population will create an increase in GDP per capita. The variables, however, capture other individual effects as well, and therefore cannot be excluded simply because of multicollinearity. This outlined endogeneity is not expected to extensively disturb the regression, since the data sample is relatively large (6084 observation). In summary, the main problem is some extreme outliers in the residuals that weaken the estimates.

Conclusion of the results

We have concluded that China's corruption effects differ from those of the rest of the world, although with some uncertainty in Model 2. We do not know why the parameter is insignificant, but a general explanation for both models to have inherent weakness, is the not entirely Gaussian distributed residuals.

On the one hand, the significance in the CPI parameter estimate and the slightly higher adjusted R^2 in Model 1, are advantages of Model 1 over Model 2. On the other hand, Model 1 does have an incorrect parameter estimate on import taxes, which is an indicator of an error in the model specification. We cannot tell whether the error is due to non-linearities, or due to something else. But according to the results in Model 2, with all the parameters showing the right sign and according to the study by Dutt and Traca (2005), we have reason to believe that non-linear effects in CPI exist.

4 Concluding discussion

This thesis began by presenting the peculiarity of China's corruption effect. Contrary to the corruption research field's suggestion, China's level of corruption and level of trade appeared to not be negatively correlated. An empirical investigation has been carried out in this thesis to determine if China's corruption effects differ from the rest of the world's. In the analysed data sample from 2003, this was found to be the case.

The empirical results will shortly be discussed in relation to the theory and in the context of China. Before that though a short discussion will outline how restrictions in the data might have affected the empirical results.

This thesis examines one year, 2003. Even though 2003 has been carefully chosen in order to avoid year specific occurrences, it is impossible to determine whether the corruption effects are due to the fact that China's economy underwent a period of transition, or whether the estimated corruption effects are specific for China. Given the nature of corruption, there is a risk that corruption effects observable in 2003 data are lagged and not connected to 2003's level of imports. One could argue that, due to Guanxi, lagged periods is a more plausible assumption in the context of China. Corruption equilibria are difficult to abandon, due to the economic incentives to stay: the trade off between gaining money and the risk of being corrupt. A corruption equilibrium intertwined with Guanxi is probably even more difficult to leave because of the social rules and commitment.

We will now concern ourselves with the investigated sample of countries. There are approximately 193 (depending on definition) countries in the world, however the CPI index only covers 90 countries. This restriction, together with missing trade as well as GDP data, has shrunk the sample size considerably. The volume of data is still more than enough for getting statistically significant results in the regression; the problematic part is the resulting sample of countries. The missing countries are often developing countries with poor institutions, which are not able to deliver proper statistics. Since having poor institutions is closely related to corruption, the presence of these countries could theoretically change the results in this thesis. However, when more data is available in the future, we encourage others to validate this study.

China's corruption effects have puzzled other researchers (e.g. Svensson, 2005), and has been found to be different, (de Jong and Bogmans, 2010; Thede and Gustafson, 2012). China is known to belong to a predictably corrupt system (Thede and Gustafson, 2012). This gives confidence in the results of the empirical investigation of this thesis. Furthermore, as mentioned above, the applied models correct for effects such as trade policy and GDP, which gives reliability to the results.

Here follows a discussion of possible underlying reasons for China's characteristic corruption effects. As a result of liberalisation reforms in China in 1978 and onwards, decentralisation of the government has occurred. This has led to an increase in corruption. This behaviour is expected for a communist country transitioning towards market economy. What distinguishes China, is its corruption effects on trade.

China stands out in its ability to manage both corruption and a high level of trade; specifically, imports increase without decreasing corruption. Most likely, the

characteristics of Chinese corruption explain this phenomenon; particularly, a high level of predictability within the corruption. Predictability enables corruption costs to be incorporated into the price as "normal" extra cost, with minimal uncertainty. Three prominent factors behind China's high predictability are: China's strong state having the ability to monitor bribe collection, China's size of bureaucracy and the phenomenon Guanxi which normalises corrupt actions and creates trust by instilling social dimensions into corruption.

We will start by discussing the ability to monitor bribe collection in the light of decentralisation. It might seem contradictory that China, having undergone decentralisation, would still have only a single bribe collector. This is explained by the step-by-step transition through governmental reforms, maintaining governmental control through each step. China is still, after decentralisation, in part a planned economy with a prevailing strong state.

The level of bribes decreases with one single bribe monitor, since all costs will be taken into consideration at the same time. Although the overall level is higher, more traders can afford to be on the market. Hence more trade will occur. As far as risk is concerned, civil servants with superior bribe collectors have minimal risk of being caught by the police. There are two effects in interplay here: firstly, the superior will probably not file charges against the civil servant for acting within the norm, and secondly, the police and government belong to the same body, which makes it less likely that the police will intervene independently. Even though we cannot claim that the Chinese police are entirely corrupt, with references to the CPI and the theory of the disadvantages of honesty in a corrupt country, it is plausible to assume that the police are corrupt and would allow state monitored bribe collection. When it comes to catching local servants

trying to profit outside the norm, though, the police might be quite strong. Therefore, individuals and traders are usually aware of the normal level of bribes – i.e., one single bribe collector contributes to predictability.

Speculatively, it can be reasoned that in the opposite case of many bribe collectors, where only fewer traders can afford to stay on the market, the strongest trader would gain a monopoly position. Their larger cost could then be transferred to the price of the good, and they could still survive on the market. Then, the overall amount of trade wouldn't be affected. Considering that we are investigating international trade, and not the inner market of China, this is faulty reasoning. Trade happens continuously (goods are flowing across the border every day) and even though the strongest trader would gain a monopoly position, the added costs would give them a disadvantage on the global market. Therefore, a lower level of corruption in each service with a higher amount of total corruption is needed to mitigate hampering of trade. The anomalous corruption effects on trade are probably a sign that China has succeeded in this, meaning that it can still trade even with a high level of corruption.

We will now turn our attention to the size of bureaucracy and its impact on corruption effects. A large bureaucracy is known to hamper market efficiency, as discussed in the introduction, but considering that the country also has corruption, the outcome is ambiguous. In a similar manner as high trade taxes pave the way for corruption, which in turn enables trade to flow, a state with arduous bureaucracy can be helped by corruption. The underlying reason is the emergence of black market businesses that speed up the handling of permissions and information.

China has a big state, high economic growth and a high level of trade, which is a peculiar combination. However, China also has a high level of corruption. Although one of China's goals today is to combat corruption, it is plausible that China's corruption has been a facilitating element in its economy, and contributed to economic growth and trade. This is in line with previous corruption theory, mentioned earlier (Leff, 1964; Huntington, 1968). However, this facilitating effect of corruption is expected to decrease with the emergence of market economy. Corruption will then turn back into a cost, which will increase transaction costs and hamper growth and trade. With this in mind, we do not know whether China's corruption effects will remain the same in the future.

In addition to analysing the state itself, analysing consequences of the the state's organisation is crucial. Guanxi has been outlined earlier in this thesis to be a consequence of the state organisation, of arduous bureaucracy and the lack of transparency. Networking, with varying levels of corruption involved, has emerged and is now part of daily life in China. Due to the elements of friendship and kinship, trust is prominent in Guanxi. This in turn contributes predictability to China's corruption. However, considering Luo's fear of increases in the dimension of instrumentality within Guanxi, particularly less care and more hard business – which is closer to the common definition of corruption, with its well-known corruption effects – China may lose its unique corruption effects in the future.

This thesis has, apart from determining that China's corruption effects differ from those of the rest of the world, discussed possible underlying causes of these anomalous corruption effects. These outlined underlying causes however do not have to be valid *only* for China. Guanxi, for instance, exists in other East Asian countries such as Japan

and South Korea, and many other East Asian countries do also have large bureaucracy. More studies on countries with corruption effects similar to China's would therefore be interesting, in relation to the outlined causes in this thesis: predictability, Guanxi and large bureaucracy. An investigation of predictability within the phenomenon Guanxi is also of interest.

Data sources

GDP and GDP per capita data is from The World bank (<http://data.worldbank.org/>), November-2011.

Trade data containing import tax and imports value is from World Integrated Trade Solution (part of The World Bank) (<http://wits.worldbank.org/>), November-2011.

Data on physical and social distance is from CEPII (http://www.cepii.fr/welcome_en.asp), November-2011.

Data on corruption is from Transparency International (<http://www.transparency.org>), November-2011

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Appendix 1: Correlation matrix, Model 2

	IMP	G _j	G _i	GDP _i	GDP _j	IT _i	CPI _i	SB _{ij}	CH _i	SL _{ij}	D _{ij}	CPI _c	CPI ²
IMP	1,00	0,65	0,27	0,39	0,17	-0,10	0,10	0,16	0,09	-0,03	-0,25	0,09	0,09
G _j	0,65	1,00	-0,13	0,56	-0,08	0,06	-0,09	0,02	0,04	-0,12	-0,02	-0,03	-0,08
G _i	0,27	-0,13	1,00	-0,09	0,58	-0,23	0,39	-0,03	0,03	-0,08	0,18	0,24	0,36
GDP _i	0,39	0,56	-0,09	1,00	-0,06	0,01	-0,07	-0,03	0,06	-0,08	-0,08	-0,02	-0,06
GDP _j	0,17	-0,08	0,58	-0,06	1,00	-0,48	0,87	-0,07	0,00	-0,03	0,08	-0,12	0,82
IT _i	-0,10	0,06	-0,23	0,01	-0,48	1,00	-0,48	0,00	-0,01	0,01	0,04	0,03	-0,48
CPI _i	0,10	-0,09	0,39	-0,07	0,87	-0,48	1,00	-0,06	-0,02	0,05	0,11	-0,09	0,99
SB _{ij}	0,16	0,02	-0,03	-0,03	-0,07	0,00	-0,06	1,00	0,14	0,10	-0,40	0,04	-0,06
CH _i	0,09	0,04	0,03	0,06	0,00	-0,01	-0,02	0,14	1,00	0,06	-0,13	0,00	-0,02
SL _{ij}	-0,03	-0,12	-0,08	-0,08	-0,03	0,01	0,05	0,10	0,06	1,00	-0,05	-0,05	0,07
D _{ij}	-0,25	-0,02	0,18	-0,08	0,08	0,04	0,11	-0,40	-0,13	-0,05	1,00	0,05	0,14
CPI _c	0,09	-0,03	0,24	-0,02	-0,12	0,03	-0,09	0,04	0,00	-0,05	0,05	1,00	-0,10
CPI ²	0,09	-0,08	0,36	-0,06	0,82	-0,48	0,99	-0,06	-0,02	0,07	0,14	-0,10	1,00

