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A sectoral analysis of the corruption-growth relationship

Abstract

Notwithstanding the large body of research that has been conducted on the effects of corruption on economic growth, findings on this relationship remain heterogeneous. Aggregate analyses on both a cross-country and regional level appear insufficient in explaining why corruption is conducive to growth in some settings while being harmful in others. In this study, I reveal that sectoral differences play a decisive role. The regressions are estimated with fixed effects models, using panel data from 1995-2015. The effects of corruption on growth are examined across three sectors (resources, manufacturing, services) and six regions (Asia, Central Asia, Sub-Saharan Africa, Middle East and Northern Africa, OECD countries, Latin America). Two major findings can be reported. First, both on an aggregate and regional level, growth in the resource sector is not significantly affected by high levels of corruption. Contrary, corruption negatively affects overall growth, as well as the growth in the manufacturing and services sectors. Second, corruption in combination with high resource rents hampers growth, whereas the sole effect of high resource rents tends to stimulate regional growth in Asia, Latin America and MENA. This suggests that the adverse growth effect of corruption outweighs the adverse growth effect of resource abundance.

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1. Introduction

How does corruption affect growth? According to conventional wisdom, the answer seems evident: corruption impedes economic prosperity. Events like the recent plunge of the Brazilian stock market by 8.8% in just one day (Watts, 2017) as a reaction to the large-scale corruption scandal and the expectedly negative aftermaths for the Brazilian economy (Yuk, 2017), appear to justify this assumption. Albeit the multitude of existing literature, empirical findings on the effects of corruption on economic growth remain heterogeneous. While some scholars support the thesis that corruption has detrimental effects on growth, others regard corruption as a lubricant that fuels growth. Existing research has mostly focused on aggregate relationships on either country or regional level. As aggregate examinations appear improper to solve the heterogeneities, however, I will analyse the corruption-growth relationship on a more fine-grained sectoral level. Derived from the proposition that the effect of political instability and corruption on FDI inflows is sector-specific (Burger et al., 2016), the corruption effect on economic growth is likely to vary across sectors as well.

Broadly, the academic literature in this rather nascent field of study (Danon, 2011) can be grouped into proponents of the *sanding the wheels approach*[1] who regard corruption to be toxic to growth, whereas supporters of the *greasing the wheels approach*[2] stress the tonic effects of corruption on growth (Méon & Sekkat, 2005; Danon, 2011). The supporters of the sanding the wheels approach refer to the adverse consequences of corruption as a rent-seeking activity, such as the creation of market disincentives and misallocation of resources. In accordance with this view, Rose-Ackerman (1996) points out the underlying high costs of corruption such as inefficiencies, unfairness, and the undermining of political legitimacy. Contrary, followers of the greasing the wheels approach argue that corruption helps to circumvent rigid and inefficient institutional structures, leading to a rise in investments that fuel economic growth. Amongst the earliest of them is Leff (1964), who argues that corruption can have a positive influence on growth in environments where governments are hostile or have other priorities. The paradox between those two approaches implies that the examination of the corruption-growth relationship is a complex issue.

What might be the reasons for those mixed results in economic research? Possibly, different study set-ups concerning periods, countries, and variables play a role. Farrag and Ezzat (2016) emphasise that many determinants of growth that are included as control variables are in fact influenced by corruption as well, leading to inaccuracies in measuring the intended effect. Besides, early research is based on aggregate cross-country studies that fail to capture regional differences. More recently, however,

[1] See for example: Mauro, 1995; Rose-Ackerman, 1996; Mauro, 1997; Swaleheen, 2011; Lambsdorff, 2002; Méon and Sekkat, 2005.

[2] See for example: Leff, 1964; Lui, 1985; Huntington, 1968; Méon and Weill, 2010; Paksha Paul, 2010.

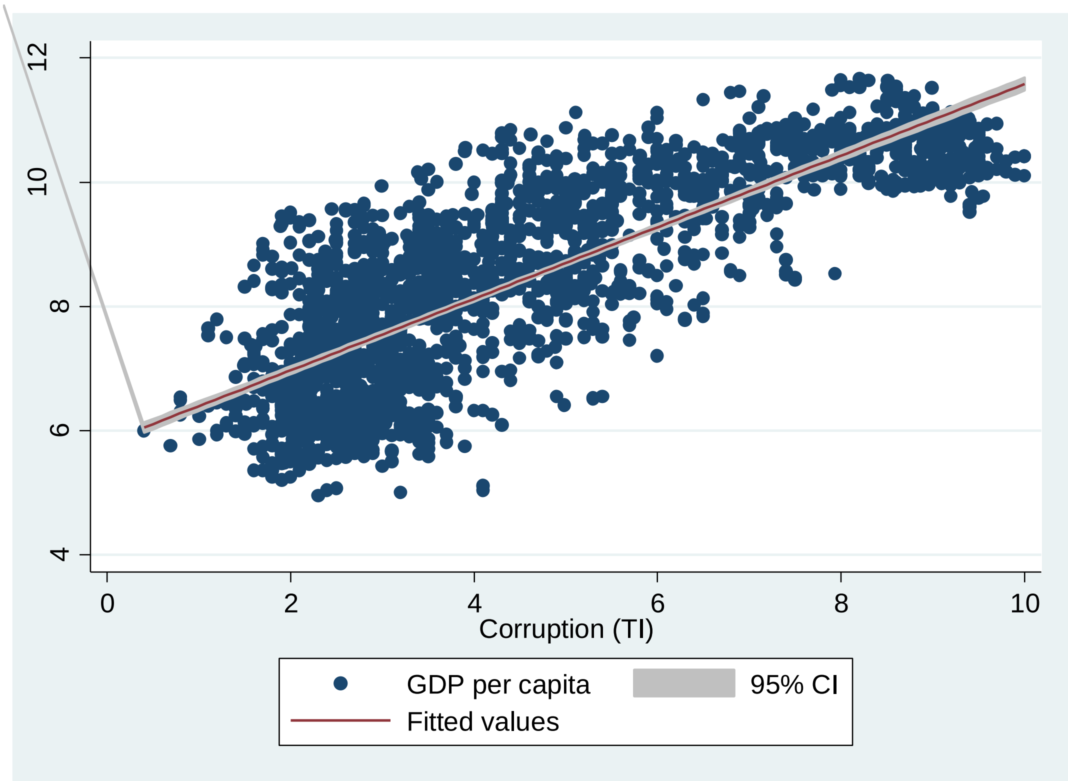
researchers have started to increasingly conduct analyses on a regional level (Guetat, 2006; Farrag & Ezzat, 2016; Huang, 2016). In fact, significant differences across regions in the growth impact of corruption were found. Regions that are characterised by centralised corruption where bribers pay "speed money" do not seem negatively affected by corruption, as evidence from Asia suggests (Huang, 2016). Decentralised corruption, however, hampers economic growth, as many people are involved which increases uncertainty and lengthens processes (Shleifer & Vishny, 1993). Such effects have been found to prevail in African countries (Gyimah-Brempong & de Camacho, 2006).

Yet, the empirical results of regional analyses are not homogenous. More nuanced investigations regarding the determinants of the corruption-growth relationship are therefore needed. Aiming for further refinement to disclose those determinants, I will perform an analysis on the sectoral level. This novel approach has not been conducted previously and hence contributes valuably to the existing body of knowledge. In fact, sectors differ in various respects, and those differences are likely to influence the effect of corruption (Burger et al., 2016). A striking distinction is that natural resources are geographically bound which imposes substantial location restrictions on extraction companies (Busse, 2004); in contrast to manufacturing and services firms, resource companies cannot switch locations easily. As a consequence, the resource sector might be unaffected by high levels of corruption, while both manufacturing and services sectors might be negatively influenced. For the purpose of this study, I define three sectors: services, manufacturing and resources.

Besides, I will examine the effects of resource abundance on both regional and sectoral level and in combination with corruption. Resource abundance might be another decisive factor in explaining the different effects of corruption on economic growth across countries. Previous research has coined the term *resource curse*, as many resource-rich countries belong to the poorest and least-developed on earth (Gelb, 1988; Ross, 1999). Mechanisms like the *Dutch Disease* helped to develop explanations for why resource abundance can exert such detrimental effects on societies and economies. A research incorporating sectoral differences in the corruption-growth relationship and resource-richness in combination with corruption has not been performed.

The scatterplot in **Figure 1** shows the corruption-growth relationship on the basis of all countries and years. The observed effect of higher corruption (indicated by lower corruption index ratings) leading to lower GDP per capita supports the sanding the wheels approach. In the course of this study, I intend to analyse the relationship between corruption and growth in more detail; across sectors, regions, and combined with resource-richness.

Figure 1: Scatterplot of the corruption-growth relationship



The remainder of this paper is organized as follows: **Chapter 2** contains the literature review and approaches the many-faceted issue of corruption and its implications. **Chapter 3** elaborates on the econometric approach of this research, focusing on the model and data used. **Chapter 4** comprises the results of the empirical analysis. Lastly, **Chapter 5** finishes this paper with the conclusion.

2. Literature Review

2.1. Definition of corruption

Corruption is a global occurrence that is as old as mankind itself (Sohmen, 1999). Being a many-faceted and complex mechanism that it is mostly explained by various causes, corruption occurs in manifold forms and impacts economies and societies in various ways (Tanzi, 1998). According to Rose-Ackerman (2004), the meaning of the term 'corruption' changes with the speaker and thus defining corruption is not a straightforward task. A commonly used definition of corruption in literature[3] stems from the World Bank, who defines corruption very broadly as "the abuse of public office for private gain" (World Bank, 1997). More specific, former World Bank's General Counsel Ibrahim Shihata says

[3] See for example: Tanzi (1998); Treisman (2007).

that corruption occurs whenever "a position of trust is being exploited to realize private gains beyond what the position holder is entitled to" (World Bank, 1997). As such, corruption is a form of the principal-agent problem where the public official is the agent and society's members represent the principal (Shleifer & Vishny, 1993; Bardhan, 1997; Groenendijk, 1997). A typical situation arises when a civil servant (agent) compels a citizen (principal) to pay a bribe for a public service that is theoretically free of charge. The World Bank definition implies, however, that corruption is limited to the public sector and is non-existent in private sector activities. This is clearly not true, as many corporate corruption scandals demonstrate (Ashforth et al., 2008). Tanzi (1995) thus proposes a more general definition, where corruption is defined as the "Intentional noncompliance (...) aimed at deriving some advantage (...)".

Gyimah-Brempong & de Camacho (2006) highlight that corruption must not be equalized with illegality. In fact, corrupt activities are not necessarily illegal and vice versa. As I will follow an economic approach rather than a legal one, the question if illegality is subordinate in this paper. Instead, I will apply the conventional definition of corruption, whereas any abuse of public power for private gain is a corrupt practice.

2.2. Causes and effects of corruption

Corruption is caused by various factors (Dimant & Tosato, 2017) that differ between countries and regions and are thus to be identified contextually. Amongst others, the size of the public sector, regulatory quality and the government structure are acknowledged causes of corruption (Lambsdorff, 2007). Besides, cultural differences (e.g. religion and acceptance of hierarchy) that are often deeply rooted in societies affect corruption (Paldam, 2002; Lambsdorff, 2007). Because of the time-invariance of cultural variables, it is plausible to assume that the relationship is not two-way causal but rather goes from culture to corruption (Lambsdorff, 2007). Other factors that indirectly promote corruption are, amongst others, penalty systems, the level of public sector wages, and examples by the leaders (Tanzi, 1998).

The effects of corruption are manifold and widely regarded detrimental in both economic and social spheres (Transparency International, 2017): From impeding democracy and the rule of law, to depleting national wealth, deterring investment, undermining a society's trust in governments and political institutions and environmental degradation. Generally, supranational organisations point out the negative impacts of corruption. The World Bank considers the fight against corruption as a "priority for the institution", as not only the economic loss of corruption is enormous, but corruption also presents a major obstacle to end extreme poverty (World Bank, 2016). Often, public funds are being directed towards lucrative mega projects in construction that benefit a corrupt elite, rather than being directed towards service delivery for the poor (USAID, 2005). In their effort to tackle corruption, the United Nations have stipulated the issue into their 17 United Nations Sustainable Development Goals.[4] In this research, however, I will solely focus on an economic viewpoint on corruption rather than a political, social or environmental one. Scholars have identified both direct (e.g. reduction of public revenue) and indirect (through other determinants of economic growth such as e.g. investments) effects of corruption on economic growth (Tanzi, 1998; Pellegrini, 2011). A more elaborate discussion on the contradicting views regarding the effects that corruption exerts on growth follows in **Chapter 2.3.**

2.3. Two different approaches on the effect of corruption

Disagreement about the consequences of corruption on economic growth remains among economists. In the following two subsections, I will review the underlying arguments of both the proponents of the sanding the wheels approach (**Chapter 2.3.1.**) and the proponents of the greasing the wheels approach (**Chapter 2.3.2.**). In both cases, I will begin with a review of studies that theoretically analyse the link between corruption and growth. A review of the respective empirical studies and their results follows.

2.3.1. Sanding the wheels

The proposition that corruption has a negative influence on an economy is supported by a large body of economic research. Proponents of this sanding the wheels approach argue, that corruption deteriorates economic growth through various channels. To begin with, many economists regard corruption as a problem of rent-seeking behaviour (Rose-Ackerman, 1996; Lambsdorff, 2002), that is, the exploitation of economic conditions or manipulation of public policies with the aim of making profit. As a consequence of rent-seeking activities, overall economic efficiency is reduced, fuelled by misallocated resources and distorted market incentives (Gyimah-Brempong & de Camacho, 2006). A further effect of rent-seeking is constituted in the attraction of highly qualified and educated personnel that would otherwise work in more productive fields, which has adverse consequences on economic growth (Murphy et al., 1991). Besides, institutions and their quality have been found to act as an important transmission channel (Kaufmann, 2005). On the one hand, institutions are being negatively influenced by corruption, while negatively affecting economic growth on the other hand. Hence, well-

[4] Target 16.5 of the Sustainable Development Goals: "substantially reduce corruption and bribery in all their forms".

functioning institutions act as a cornerstone for the abstinence of high corruption levels and boost economic prosperity (North, 1990; Knack & Keefer, 1995). Similarly, Shleifer and Vishny (1993) claim that high corruption levels result from weak governments who fail to control their agencies. Bliss and Di Tella (1997) show that firms are inclined to exit markets with rampant corruption, thereby lowering a countries' production output and hence reducing its growth prospects.

Mauro (1995) is accredited to be among the first scholars who empirically tested the corruption-growth relationship. In his cross-country study, he found that corruption negatively impacts investment and consequently lowers economic growth. In a second study, Mauro (1997) reinforces his earlier findings on the adverse effect of corruption on economic growth. Since then, many economists have strengthened his findings that support the sanding the wheels thesis (Méon & Sekkat, 2005; Swaleheen, 2011). Moreover, a number of studies have quantified the economic effect of corruption on the growth rate (Del Monte & Papagni, 2001; Mo, 2001). According to Mo (2001), a 1% increase in corruption lowers the growth rate by as much as 0.72%. Research has presented a number of reasons that explain the mechanisms through which corruption negatively affects economic growth. By fostering uncertainty, corruption has been found to create an unfavourable investment climate that negatively impacts foreign direct investments (Wei, 1997; Wei, 2000; Habib & Zurawicki, 2002; Zhao et al., 2003). Corruption also increases the costs of doing business (Gyimah-Brempong & de Camacho, 2006): Production costs rise because corruption acts as an inefficient transaction tax, and higher transaction costs result from corrupt practices being made in secrecy, thereby evading from legal enforcement. Finally, the inefficient allocation of resources has also been found to decrease economic growth because of productivity reduction (Gupta et al. 2002; Méon & Sekkat, 2005).

2.3.2. Greasing the wheels

Despite the conventional wisdom that corruption impedes economic growth, there are several economists who argue the contrary. The proponents of the so-called greasing the wheels approach offer diverse explanations for why this is the case. According to Leff (1964), corruption may positively affect economic development by reducing uncertainty and thereby leading to increased investments. He describes corruption as an "extra-legal institution" that can in fact be efficiency-enhancing, especially in settings with inefficient, indifferent, or hostile governments. Similarly, Lui (1985) claims that corruption attracts investments due to reduced waiting times and a more efficient resource allocation. Applying a Nash Equilibrium in an auctioning setting where a queue is involved, he argues that bribe payments are in fact a useful component to speed-up processes. Those arguments are supported by Huntington (1968), who claims that periods of high corruption coincide with rapid wealth creation and economic modernization. Another claim is brought forward by Danon (2011).

According to him, the prospect of bribe payments incentivises public officials to work more efficiently and attracts highly qualified personnel into public positions. Braguinsky (1996) argues that corruption conduces growth dependent on the environment: while having a positive growth effect in a "capitalist" environments, corruption negatively affects growth in "totalitarian" environments. Finally, some economists claim, that there is an optimum corruption level which is both output and growth maximising (Acemoglu & Verdier, 1998; Dzhumashev, 2014).

The number of empirical findings that support the theoretical claims of the greasing the wheels approach is rather limited. In a study that includes both developed and less developed countries, Egger and Winner (2005) find evidence of a positive relationship between corruption and FDI and conclude that corruption stimulates the inflow of FDI. According to Méon and Weill (2010), corruption enhances efficiency in countries with very ineffective institutions. This efficiency-enhancing effect is traced to corruption that facilitates business activities by circumventing or accelerating bureaucratic processes. For the case of Bangladesh, evidence of a positive relationship between corruption and growth is reported (Paksha Paul, 2010). The emergence of corruption-growth studies on a regional level has in fact increased the number of empirical findings that report a positive effect of corruption on regional economic growth. Those results and its implications are discussed in **Chapter 2.4.**

2.4. Different types of corruption

In an attempt to explain the heterogeneous findings of the aforementioned aggregate analyses, scholars have pointed out the existence of different types of corruption that potentially impact growth in disparate ways. Those types or corruption are likely to be region-specific, which gives rise to examining the corruption-growth relationship on a regional level (Gyimah-Brempong & de Camacho, 2006). This novelty has become possible through improved data availability and delivers more fine-grained results than cross-country studies.

A commonly used classification is the distinction between centralised (or coordinated) and decentralised (or uncoordinated) corruption (Tanzi, 1998; Gyimah-Brempong & de Camacho, 2006). Centralised corruption refers to a "one-stop" mechanism where the briber pays so-called "speed money" to a single person who in turn guarantees the conduct of the whole process. This type of corruption is perceived to grease the wheels of conducting business, as it facilitates and shortens lengthy and bureaucratic processes. The rationale is that without the possibility of "speed money" investors' incentives would be reduced. The impressive growth rates of some Southeast Asian countries in the 1990s (despite their high corruption levels) have often been taken as an example that centralised corruption acts as a lubricant of economic development (Tanzi, 1998).

In contrast, decentralised corruption involves the bribe of several people along the way. The uncertainty factor of the final success of the undertaking is high, as no one along the chain can individually guarantee the ultimate success. Consequently, decentralised corruption is seen as detrimental to an economy by discouraging any kind of conducting business or investment and is thus considered more harmful to growth than centralised corruption (Shleifer & Vishny, 1993). According to scholars, the decentralised corruption prevails in African countries (Gyimah-Brempong & de Camacho, 2006).

Still, the findings of regional analyses remain inconsistent, as an exemplary glance at the MENA region reveals; A region, where corruption is deeply rooted and widely spread (Johnson & Martini, 2012; Warf, 2015). While some scholars have found a negative relationship of corruption and economic growth (Campos et al., 2010; Farrag & Ezzat, 2016), others have detected positive (Kutan et. al, 2009) or insignificant relationships (Bhattacharya & Wolde, 2010). The latter proposition is explained with economic actors who learn to adapt and deal with endemic corruption and its consequences (Bhattacharya & Wolde, 2010).

2.5. Sectoral differences

Albeit the heterogeneities in empirical findings, regional analyses are of great value as they demonstrate that the effect of corruption on economic growth is significantly different across regions. Yet, regional characteristics might still not be nuanced enough and I will thus examine sectoral differences. The call for such for such an extension has also been raised previously (Kutan et. al, 2009). As sectors differ significantly from each other in various respects, I expect corruption to affect growth differentially within the three sectors examined: resources and energy, non-resource manufacturing, and services.

Amongst others, sectoral differences are revealed in the location choices (Burger et al., 2015; Busse, 2004), timing considerations (Lieberman & Montgomery, 1988), advertising and R&D intensity (Andras & Srinivasan, 2003), and investment reversibility (Pindyck, 1990). Leaving political restrictions aside, investment locations for both manufacturing and services can be chosen quite freely and flexibly due to a lack of particular location requirements (Burger et al., 2015). Investments in natural resources on the contrary, are often restricted in the location of their business activities due to natural resources being geographically bound (Busse, 2004). Many oil rich countries (e.g. Angola) are highly corrupt but oil firms' choice of production location is limited due to the disperse global allocation of crude oil. The mining sector faces the same dilemma, with many resource rich countries (e.g. DR Congo) being highly corrupt. As a consequence, investments in natural resources might not be hampered by rampant corruption, as the limited choices of production prevent firms from consciously deciding to locate production in less corrupt countries. Conversely, this implies that corrupt countries whose economies heavily depend on natural resource rents, economic growth might not be negatively affected by prevailing corruption as firms will invest anyway.

Besides location considerations, the timing of investments can also constitute a critical factor (Lieberman & Montgomery, 1988). First mover advantages might be more beneficial in some sectors, while being of less importance in others. Mason and Weeds (2010) claim that firms in the resource sector are incentivized to obtain a first mover advantage, for example in the form of exclusive extraction permits. Limited supply of natural resources as well as high entry costs are the drivers behind this incentive to become a first-mover (Burger et al., 2015).

Sectors also differ in their advertising and R&D intensity, with consumer product firms having a higher advertising intensity than manufacturing product firms who have a higher R&D intensity (Andras & Srinivasan, 2003). Because of the uniformity of natural resources, advertising intensity is supposedly low. The R&D intensity in the resource sector might be subject to big differences, depending on the resource location and the extraction method applied.

Irreversibility considerations are also important determinants of investment decisions (Pindyck, 1990), especially when facing uncertainty and political instability (Dixit & Pindyck, 1994). Considering that resource extraction is usually accompanied by heavy upfront investments, capital requirements tend to be lower in the manufacturing and services sector. Hence, the irreversibility, or at least the costs associated with reversing an investment decision, are different across sectors (Burger et al., 2015).

Aggregate analyses on country or regional level fail to capture sector specifics. Taking into account those differences, however, potentially reveals valuable insights and helps to further explain the nuances of the corruption-growth relationship. Similarly, the effect of political instability (corruption being one of multiple measures) on sector-specific FDI flows has produced very interesting results (Burger et al., 2015): political instability reduces FDI flows only into commercial services and non-resource manufacturing, whereas it does not impact FDI flows in non-tradables and natural resources. In accordance with those findings, I expect corruption to negatively affect growth in both manufacturing and services, while having no significant growth effect in the resource sector.

2.6. Natural resource abundance

One might assume that natural resource abundance results in economic prosperity: Resource extraction generates jobs and attracts investments, which should theoretically stimulate economic growth (Sachs & Warner, 1995). Indeed, some developed countries (e.g. Canada and Norway) managed to convert resource-richness into an increase in national wealth (Mehlum et al., 2006). When looking at the DR Congo, Niger, Venezuela, and other developing countries, however, resource abundance appears to be a curse (Sachs & Warner, 1995). The effect of natural resources on the development of countries has been researched extensively and the existence of a resource curse is nowadays widely accepted (Gelb, 1988; Ross, 1999). A bundle of structural problems that are being accused to elicit the resource curse are summarized within the Dutch Disease effect (Neary & Van Wijnbergen, 1986). The Dutch Disease describes how resource production leads to de-industrialization, higher corruption and rent-seeking behaviour of public officials and the impediment of investments in education and infrastructure (Sachs & Warner, 1995).

Interestingly, the topic of resource abundance has not raised considerable attention within the corruption-growth studies. Yet, facing the prevailing heterogeneities within the corruption-growth literature, shedding light on the role that resources play in this context seems promising and worthwhile to examine. Previous cross-country analyses,[5] however, are not sensitive enough to capture resource-richness and regional analyses also often fail in this regard. Within the MENA region, for example, there are both resource-rich countries (e.g. Saudi Arabia) and countries with scarce resources (e.g. Morocco). A general labelling of a region regarding its resource-richness does therefore not do justice to the differences within regions.

In this research, I will consider the effects of the resource-richness on both a regional and sectoral level and in combination with corruption. In accordance with previous findings on the resource curse (see for example Ross, 1999), I expect that an increased resource importance is negatively correlated with growth. Combined with a corruption measure, the results on the regional and sectoral level might well strengthen this relationship. Besides, it will be particularly interesting to observe the effects on the resource sector.

3. The Econometric Approach

3.1. Model

In order to examine the effect of corruption on economic growth, I use panel data from 136 countries between 1995-2015. Due to data restrictions, the number of countries in the regressions will be smaller.[6] 26 of the countries are from Asia, 5 from Central Asia (CA), 20 from Latin America (LA), 17 from Middle East and Northern Africa (MENA), 39 from Sub-Saharan Africa (SSA) and 29 from

[5] Please refer to the studies discussed in **Chapter 2.3.**

[6] I include only countries that have at least three observations to be able to see an effect over time. Besides, working with just one observation per country is not possible because of country FE in my FE model.

the OECD. The inclusion of Central Asia as a separate region is very rare in empirical research. Yet, I decided to include this region because the countries are all (except for Tajikistan) very resource-rich, which makes the region homogeneous in this regard. A list with all included countries per region can be found in **Appendix A**.

Two distinct measures of corruption are employed to increase the robustness of the results. Economic growth, the dependent variable, is measured in levels of GDP per capita. Following the conventions in the growth lecture[7] I will add several control variables: government expenditure, gross capital formation, population growth, inflation, FDI inflow, and secondary school enrolment. Aside from adding controls, I argue that the nature of the data set requires to control for fixed effects. The model of choice is thus a fixed effects (FE) estimator. Using both country FE (Φ) and region-year FE (Ψ) enables me to account for unobserved time-invariant heterogeneity and prevents the threat of an omitted variable bias because of differences across countries, regions, and time. Country FE are needed, because time-invariant factors that influence the corruption level (e.g. culture, religion, institutions) are heterogeneous across countries (Treisman, 2000). Furthermore, country FE control for the fact that some countries have less observations. Region-year FE control for everything that is constant in this region for this period which helps to discard variation that barely changes.

A further strategy to make the regressions more robust is the use of a cluster-robust-VCE estimator which accounts for correlated disturbances across groups. Using this estimator allows to reduce the standard error (SE) and to deal with problems of heteroscedasticity. Taking into account that the effects on growth will probably happen on a delayed basis and to treat them as exogenous in the previous period (Gyimah-Brempong & de Camacho, 2006), all independent variables are lagged by one year.

Below, the model for the baseline regression is depicted:

$$\ln(\text{gdp})_{irt}^{S} = \beta_0 + \beta_1 cor_{i(t-1)} + \beta_2 \exp_{i(t-1)} + \beta_3 inv_{i(t-1)} + \beta_4 pop_{i(t-1)} + \beta_5 inf_{i(t-1)} + \beta_6 \ln(fdi)_{i(t-1)} + \beta_7 edu_{i(t-1)} + \Phi_i + \Psi_{rt} + \varepsilon_{irt}^{S}$$

In the growth equation presented above, it is very likely that the effect of corruption on economic growth is larger than estimated by the corruption variable (Gyimah-Brempong & de Camacho, 2006), because many control variables act as transmission channels of corruption on economic growth (Treisman, 2000; Pellegrini, 2011). This endogeneity issue and its implications will be discussed in more detail in **Chapter 5.**

[7] See for example: Mauro, 1997; Méon & Sekkat, 2005; Guetat, 2006.

Table 1: Description of variables

$\ln(\text{gdp})_{irt}^{S}$	(Log of) GDP per capita in levels; ***S*** indicates the sectors; ***i*** indicates country FE; ***rt*** indicates region-year FE
$cor_{i(t-1)}$	Corruption Index (World Bank or Transparency International); lagged by one year
$\text{exp}_{i(t-1)}$	Government expenditure (in % of GDP); lagged by one year
$inv_{i(t-1)}$	Gross Capital Formation (Investments in fixed assets in % of GDP); lagged by one year
$pop_{i(t-1)}$	Population growth rate (in %); lagged by one year
$inf_{i(t-1)}$	Inflation rate (in %); lagged by one year
$\ln(fdi)_{i(t-1)}$	(Log of) Inward FDI (net inflows in US$); lagged by one year
$edu_{i(t-1)}$	Gross enrolment ratio, secondary (in %); lagged by one year
Φ_i	Country fixed effects
Ψ_{rt}	Region-Year fixed effects

3.2. Data

3.2.1. Corruption data

Measuring corruption is a complex issue (Danon, 2011). To begin with, the boundary between corruption and related phenomena (e.g. gifting) is fluid. Besides, the assessment whether a practice is considered corrupt differs across countries, hampering a uniform comprehension. A certain practice might be regarded corrupt in one country, while being the normal way of conducting business in another country. Most strikingly, being a predominantly illegal praxis, corruption is usually hidden and hence eludes an objective measurement and quantification (Danon, 2011). In absence of such quantifiable measures of absolute corruption levels, empirical studies rely on perception-based indicators.

Among the most commonly used corruption perception indices are the Control of Corruption Indicator (CCI) and the Corruption Perception Index (CPI) (Judge et al., 2011). The CCI by the World Bank is published on an annual basis[8] and comprises data from more than 30 organizations. The index ranges between -2.5 and +2.5 with higher levels indicating less corruption. Similarly, the yearly updated CPI by Transparency International (TI) indicates less corruption with increasing figures of the index

[8] Before 2002 (for the years 1996 to 2001) the indicator was published every two years.

(ranging from 0 to 100)[9]. Both indices draw on several assessments and surveys that comprise the perception of various respondents, both individuals, and organizations. Their diverse backgrounds include the business as well as the non-profit sphere.

In general, perception-based indicators are accompanied by certain weaknesses that should be noted. First, the perceptions are based on the assessment of agents who live or work in the respective country which raises doubt concerning the comparability of results (Farrag & Ezzat, 2016). It is likely that different people perceive the same situation different from each other, depending on their cultural background and personality. The comparability across countries might also be problematic due to cultural differences that greatly impact the way 'business is done'. The indices also fail to capture whether corruption acts efficiency-enhancing or not, a differentiation that is likely to be observed depending on whether centralised or decentralised corruption prevails (Gyimah-Brempong & de Camacho, 2006). Lastly, the composition of the indices gives rise to concern as they are compiled of various heterogeneous sources which questions the overall explanatory power (Danon, 2011). Despite those weaknesses, Treisman (2000) argues that perception-based indices have their merits: cross-national scores tend to highly correlate both across time and with each other. The latter proposition is supported by Judge et. al (2011), who finds a high correlation between the CPI and CCI.

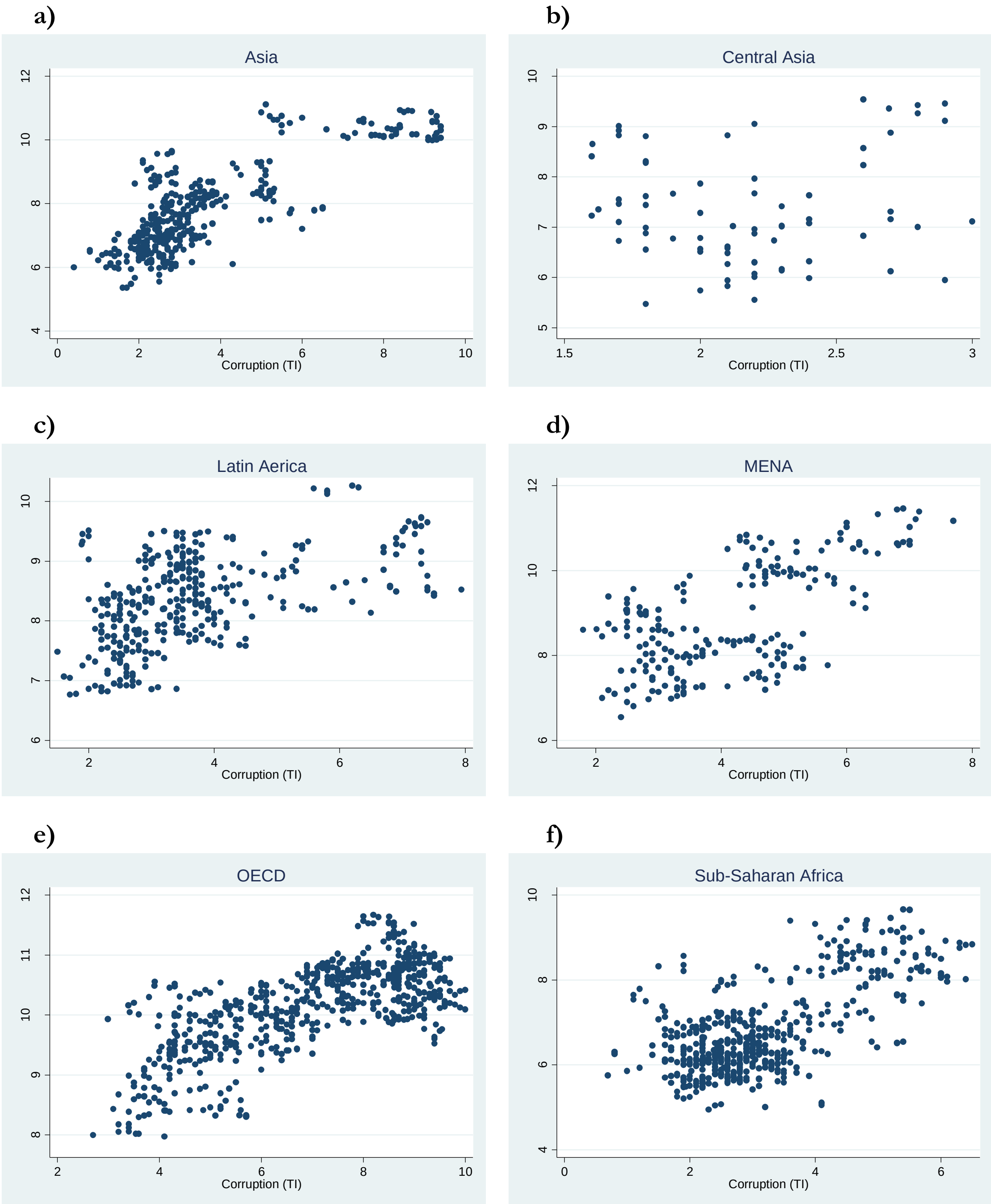
Appendix A provides an overview of the CPI scores per country, including the range of scores per country. A glance at those figures reveals rather small changes of corruption levels within countries, except for outliers such as Georgia and Uruguay. The little variation of corruption levels within countries over time (here: 21 years), is in line with the proposition that corruption is very persistent (Pellegrini, 2011). By contrast, corruption levels across countries and regions differ significantly. As part of this study is the examination of regional differences, in the following I will present some summary statistics.

Table 2: Corruption data across regions

Region	CPI mean	CPI range	No. of observations
Asia	3.6	[0.4 - 9.4]	366
Central Asia	2.2	[1.6 - 3.0]	73
Latin America	3.7	[1.5 - 7.9]	357
MENA	4.0	[1.5 - 7.7]	219
OECD	7.0	[2.7 - 10.0]	637
Sub-Saharan Africa	3.1	[0.7 - 6.5]	540

[9] In 2012, the methodology was changed to the current layout. Before, the index was ranging from 0 to 10. I adjusted for this methodological change by multiplying the data from 1995-2011 by the factor ten.

Figure 2: Distribution of country-specific CPI scores within regions



Corruption scores across Asia are the most heterogeneous compared to any other region in this sample. Bangladesh ranges at the bottom with a score of 0.4, while Singapore is the least corrupt country in Asia with a maximum score of 9.4. **Figure 2.a)** displays that most of the scores are concentrated within a range of 2 to 4, explaining the mean CPI of 3.6. The two city sates Singapore and Hong Kong range at the top. The scatterplot for Central Asian countries (**Figure 2.b)**) looks very dispersed at first glance. In fact, the scores are rather close together and the dispersion is best explained by the limited number of countries and thus observations in this region. Turkmenistan and Uzbekistan have both the lowest corruption score of 1.6, while Kazakhstan has the highest (3.0). Albeit the similar corruption scores, however, the differences across growth rates are substantial in Central Asia. The scatterplot for Latin America (**Figure 2.c)**) appears similar to the one of Asia: the majority of scores is between 2 and 4, while a small number of less corrupt countries ranges at the top which raises the overall CPI score in that region to 3.7. With a minimum score of 1.5, Paraguay is perceived the most corrupt country in Latin America, while Chile with a score of 7.9 is perceived the least corrupt one. The distribution of corruption scores in the MENA region is rather even (**Figure 2.d)**). Except from a small number of outliers, most countries range between a score from 2 to 6, leading to a mean CPI score of 4.0. Libya is at the very end of the list (score of 1.5), while Qatar ranges at the top with a maximum score of 7.7. Although being the least corrupt region overall, the CPI scores of the OECD countries are widely scattered from 2.7 to 10.0. A substantial amount of countries has scores between 7 and 10, yet, the mean score of 7.0 indicates that many countries are not in this upper group. A glance at **Figure 2.e)** confirms this observation. Latvia has the lowest score of 2.7, while both Denmark and Finland achieve the maximum possible score of 10.0. Among the more corrupt OECD countries are mainly Southern (e.g. Italy) and Eastern (e.g. Poland) European countries, whereas Scandinavian countries and Iceland tend to have the highest scores. Apart from the relatively small Central Asian region, Sub-Saharan Africa can be classified very corrupt overall with an average CPI score of 3.1. **Figure 2.f)** reveals that the majority of countries are grouped between scores of 2 and 4. Oil-rich Nigeria ranges at the bottom with a score of 0.7, while Botswana with a maximum score of 6.5 is at the top.

3.2.2. Growth variables

The dependent variable aims to capture economic growth. This will be proxied using the GDP per capita in levels. The data on national GDP per capita (measured in current US$) is provided by the World Bank. For the sectoral analysis, I use data on sectoral GDP per capita from the United Nations, who publish shares of GDP per sector. With the help of ISIC codes, this database served as the source to create the three sectoral dependent variables: resources and energy, non-resource manufacturing, and services.[10] All dependent variables are log-transformed in order not to violate the normality assumption and to better interpret the results.

[10] Resources and energy (ISIC C+E), non-resource manufacturing (ISIC D), services (ISIC G-P).

3.2.3. Control variables

Government expenditure refers to the consumption expenditures of national governments and is measured in percent of GDP. High government expenditures indicate an inflated administrative and governmental body leading to lengthy bureaucratic processes, inefficiencies, and may crowd-out effects that promote growth of the market (Levine & Renelt, 1992). Hence, government expenditure is excepted to negatively correlate with economic growth.

Gross capital formation pertains to the investments in fixed assets being made as percentage of GDP. The measure indicates how much of the newly added economic value flows in investments rather than consumption. As investments tend to strengthen the long-term competitiveness and growth potential of an economy (Levine & Renelt, 1992), capital formation is expected to have a positive influence on growth.

Population growth measures the annual change in population in percent. The effect of a growing population on the economic development is in fact ambiguous (Levine & Renelt, 1992). On the one hand, an increase in population grows the labour force, creates demand and may thus stimulate economic growth. On the other hand, population growth potentially slows down per capita growth, especially in case educational infrastructure and jobs are lacking. Despite its unclear effect, population growth is a widely used control variable in growth equations and I will therefore include it as well.

Inflation refers to the development of consumer prices and is measured in percent. Indicating the user cost of capital, high inflation rates negatively affect investments and harm economic growth (Levine & Renelt, 1992). The variable is expected to have a negative effect on economic growth.

Gross secondary school enrolment is a proxy for attained secondary education in percent. As widely recognized, human capital plays a critical role for economic prosperity as it increases the productivity, and education is the key to enhance human capital (Mincer, 1984). The variable is thus expected to have a positive effect on economic growth.

Data on all five above mentioned variables stems from the World Bank Development Indicators.

Inward FDI refers to the capital that flows into an economy by foreign investors. Many studies have shown that investment capital and expertise from abroad stimulates the local economy (Johnson, 2006). High FDI inflows, in turn, do not only lead to economic growth but also signal a favourable investment environment. Consequently, the FDI variable is expected to positively correlate with growth. The data on FDI is sourced from UNCTADs World Investment Reports. In order not to violate the normality assumption, the variable is log-transformed.

Table 3: Descriptive statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
GDP per capita	2,795	11,237.1	17,118.4	100.7	116,612.8
Corruption (TI)	2,192	4.5	2.3	0.4	10.0
Government expenditure	2,840	16.3	9.1	2.0	149.3
Gross capital formation	2,840	23.6	8.4	1.5	68.1
Population growth	2,879	1. 7	1.5	-3.3	17.6
Inflation	2,602	21.4	489.1	-35.8	24,411.0
Gross secondary school enrolment	2,031	75.5	31.3	5.1	163.1
Inward FDI	2,782	7,234.7	22,577.9	.00001	379,894

Descriptive statistics on the variables can be found in **Table 3**. In terms of GDP per capita, inward FDI and Inflation one can observe huge differences across countries. Also, differences in the other variables such as government expenditure or population growth are substantial. The corruption index with values ranging from 0.4 for Bangladesh in a certain period to 10.0 in Denmark and Finland, is no exception in this regard. One can thus draw the conclusion that this sample offers great variability and heterogeneity.

Table 4: Correlation matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) GDP per cap.	1.0000							
(2) Corruption (TI)	-0.8106	1.0000						
(3) Gov. exp.	0.3188	-0.3860	1.0000					
(4) Cap. formation	0.0310	-0.0131	0.0018	1.0000				
(5) Population gr.	-0.3048	0.2684	-0.1915	0.0479	1.0000			
(6) Inflation	-0.2195	0.2153	-0.0493	-0.0898	0.0654	1.0000		
(7) School enrolm.	0.8424	-0.7099	0.3151	0.0028	-0.4258	-0.2023	1.0000	
(8) Inward FDI	0.3689	-0.3386	0.0633	-0.0690	-0.1332	-0.0816	0.2489	1.0000

The correlation matrix among the main variables is depicted in **Table 4**. First, the determinants of growth are shown in column 1. In line with the sanding the wheels theory, corruption is highly negatively correlated with economic growth, showing a bivariate correlation of -0.8106. Also, population growth and inflation are negatively correlated with growth, whereas human (high bivariate correlation of 0.8424) and physical capital, as well as investments are all positively correlated. The signs of those growth determinants are as expected and in accordance with previous findings. Yet, government expenditure appears to positively relate to growth, which is somewhat counterintuitive.

Column 2 shows a negative correlation between corruption on the one hand, and human and physical capital, investments, and government expenditure on the other hand. Only the two variables of population growth and inflation are positively correlated with corruption. Column 2 indicates the transmission channels through which corruption affects growth (Pellegrini, 2011; Dridi, 2013). The rather strong correlation of many of the transmission channels with corruption can be interpreted as a confirmation of the above mentioned (**Chapter 3.1.**) and below discussed (**Chapter 5**) concern, according to which the effect of corruption on growth is in fact bigger than solely indicated by the corruption variable.

The correlation of the remaining variables is rather low, suggesting that autocorrelation is not an issue (Hakimi & Hamdi, 2015).

4. Empirical Analysis

4.1. Baseline regression of the corruption-growth relationship

Table 5: Baseline regression

VARIABLES	(1) **Total**	(2) **Resources**	(3) **Manufacturing**	(4) **Services**
Corruption TI	-0.0523**	-0.0172	-0.0747***	-0.0471**
	(0.0204)	(0.0326)	(0.0222)	(0.0212)
Government Consumption	0.000898	0.00607*	-0.00226	0.000366
	(0.00203)	(0.00333)	(0.00344)	(0.00208)
Capital Formation	0.00612***	0.00681*	0.00570**	0.00616***
	(0.00175)	(0.00366)	(0.00226)	(0.00179)
Population Growth	0.00258	-0.00679	-0.00525	0.00258
	(0.0103)	(0.0153)	(0.0141)	(0.00960)
Inflation	-0.00195**	-0.00137	-0.00191*	-0.00256*
	(0.000902)	(0.00130)	(0.00102)	(0.00135)
FDI Inflow	0.0228**	0.0105	0.0169	0.0254**
	(0.00922)	(0.0133)	(0.0107)	(0.0101)
Secondary School	0.000650	-0.000731	0.00102	0.00104
	(0.00122)	(0.00201)	(0.00123)	(0.00132)
Constant	8.097***	5.481***	5.999***	7.565***
	(0.182)	(0.244)	(0.180)	(0.192)
Observations	1,491	1,479	1,491	1,491
R-squared	0.864	0.734	0.730	0.866
Number of countries	130	129	130	130
Country FE	YES	YES	YES	YES
Region-Year FE	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The results yielded by estimating the baseline growth equation are portrayed in **Table 5**. Column 1 presents the results for the overall GDP per capita, columns 2 to 4 present the results for GDP per capita in the three sectors (resources, manufacturing and services), respectively. First and foremost, corruption has a highly significant negative effect on total GDP per capita.[11] This finding supports the sanding the wheels hypothesis. The effect of corruption on the different sectors is heterogeneous. Both manufacturing and services are negatively affected by corruption, which is line with my expectations. In contrast, growth in the resource sector is not significantly affected by high corruption. This finding is novel and highly interesting. Whereas lower corruption appears to impede growth in the geographically flexible sectors manufacturing and services, it does not impact the geographically bound and inflexible resource sector.

Quantifying the negative effect of corruption on GDP yields that the increase of the corruption index by 1 (in this case, after I multiplied the index by -1: being more corrupt) results in a downturn of total GDP per capita of -5.1%[12]. This remarkably strong effect is likely to be even larger, as part of the corruption effect is captured by the controls who act as transmission channels.

Among the control variables, capital formation (investments), inflation and FDI inflow show the most significant results, all in the expected direction. An increased capital formation and higher FDI inflow positively affect economic growth, whereas inflation hampers it. Interestingly, all those effects appear to be weakest in the resource sector. The three remaining controls of government expenditure, population growth and education are mostly insignificant. While education has the expected sign (expect for the resource sector), government consumption tends to exhibit an unexpected (positive) sign and the role of population growth is inconsistent.

The results may depend on the specific sample and the variables used in the growth estimation. To test the robustness of the obtained results, I will perform various robustness checks in the following. As mentioned earlier, the different indices that measure the perception of corruption come along with weaknesses. In order to ensure that the TI corruption index that I used does not drive the results I will perform the same regression again, using the alternative World Bank corruption measure. The results in **Appendix B** indicate a strong robustness of the growth estimation. First and foremost, the effect of corruption on growth is significantly negative on total GDP per capita as well as in manufacturing and services, while it is insignificant in the resource sector. Expect for minor differences, the control variables equal the baseline regression in sign and significance. According to several economists, political instability (Barro 1991; Knack & Keefer 1995) as well as weak institutions

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[11] In order to interpret the corruption variable more intuitively, I multiplied the corruption index by -1. Hence, a higher score indicates higher corruption.

[12] One additional unit of x increases y by [100*(exp(b1)-1)]%, ceteris paribus: 100*(e^(-0. 0523)-1) = -5.095%

(North, 1990; Kaufmann, 2005) negatively affect a countries economic performance. Hence, the effects political instability and regulatory quality[13] on growth are expectedly alike the effect of corruption. Replacing the corruption variable with both a measure for political stability and regulatory quality should therefore yield similar results. In fact, the results are very close as can be seen in **Appendix C**. The signs of both political stability and regulatory quality are positive, indicating that higher political stability and better regulatory quality foster economic growth. The effects are significant throughout, except for the resource sector where there are either slightly significant or insignificant. Besides, similar significance and signs can be observed throughout the control variables. In an attempt to reduce the noise within the annual data I will create 5-year averages. This method is commonly applied in cross-country studies (Gyimah-Brempong & de Camacho, 2006). Observing data from 1995 to 2015, the last of the four created periods includes six instead of five years. In principle, the results of this analysis (**Appendix D**) imply a very high robustness of the estimated regression. Corruption has a negative and highly significant influence on growth for total GDP, manufacturing and services. Again, the effect on growth in the resource sector is insignificant. Expectedly, both capital formation and FDI inflow show a significant positive relation to growth. Inflation and human resources are insignificant but show the expected sign, while the effect of government consumption and population is again somewhat blurry.

[13] Both variables are obtained from the World Governance Indicators by the World Bank.

4.2. Baseline regression including regional corruption interactions

Table 6: Regional baseline regression

VARIABLES	(1) **Total**	(2) **Resources**	(3) **Manufacturing**	(4) **Services**
Corruption*Asia	0.0128	0.0631	-0.0659	0.0176
	(0.0453)	(0.0731)	(0.0495)	(0.0541)
Corruption*CA	-0.0812*	0.0388	0.522**	-0.00172
	(0.0429)	(0.0357)	(0.227)	(0.0393)
Corruption*LA	-0.00984	0.0440	-0.0258	0.00467
	(0.0426)	(0.106)	(0.0500)	(0.0423)
Corruption*MENA	-0.00793	0.0306	-0.0227	-0.0340
	(0.0425)	(0.0452)	(0.0469)	(0.0512)
Corruption*OECD	-0.0855**	-0.0551	-0.111***	-0.0785**
	(0.0353)	(0.0482)	(0.0365)	(0.0352)
Corruption*SSA	-0.0825*	-0.0683	-0.0549	-0.0765
	(0.0425)	(0.0675)	(0.0535)	(0.0487)
Constant	8.083***	5.470***	6.021***	7.553***
	(0.179)	(0.240)	(0.181)	(0.189)
Observations	1,491	1,479	1,491	1,491
R-squared	0.866	0.736	0.733	0.868
Number of countries	130	129	130	130
Country FE	YES	YES	YES	YES
Region-Year FE	YES	YES	YES	YES
Additional Controls	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Next, the set-up of the baseline regression is extended with regional corruption interaction terms (see **Table 6**)[14]. This not only enables to explore whether corruption has significantly different effects on growth across regions, but also allows to examine sectoral differences. To begin with, the effects of corruption on growth in the resource sector is insignificant throughout all regions. Although the results on the regional level are generally less significant than on the aggregate level, this observation is very interesting and strengthens the proposition that the resource sector is unaffected by high levels of corruption. The results of OECD countries are similar to those of the overall effect in the baseline regression: corruption exhibits a negative influence on total GDP per capita, as well as in the manufacturing and services sector. Yet, no significant effect is detected in the natural resource sector. Besides, corruption in both Central Asia and Sub-Saharan Africa has a significantly negative effect on total GDP growth while the negative effect in the different sectors appears less strong. Surprisingly, the growth effect in the manufacturing sector is positive and highly significant for Central Asia which

[14] For visualization purposes, not all variables included in the regression are depicted in **Table 6**.

is counterintuitive and might be explained by the rather low sample size of five countries. The effect of corruption on growth in Latin America and the MENA region is also negative, expect for the resource sector, yet not significant. Finally, the growth effect on total GDP is positive, even though insignificant, in Asia.

The obtained results are very interesting for a variety of reasons. In the least corrupt countries, OECD, corruption has the strongest negative impact on growth. This finding is in line with previous research (Aidt et al., 2008), having found that corruption has a negative and significant effect on economic growth in countries with high quality political institutions. Similarly, economic growth in the remaining regions, except for Asia, is negatively affected by corruption. This supports the sanding the wheels hypothesis for those regions. A possible explanation for the insignificant results is that in many countries that are plagued by corruption, corruption may already be deeply rooted in society and part of the 'normal way of doing business', thus not hindering growth as in less corrupt and more developed countries (Bhattacharya & Wolde, 2010). The significant negative effect for Sub-Saharan countries may be the result of prevailing uncoordinated bribery (Gyimah-Brempong & de Camacho, 2006). The same might hold true for Central Asia, yet less research has been done for this region. Asia is the only region that shows positive, although insignificant, results, implying that corruption does not hamper economic growth in Asian countries. This result supports previous findings of centralised corruption being prevalent in Asian countries (Tanzi, 1998), whereas corruption rather facilitates than harms growth. Given the relatively large standard errors of many regional interaction terms, the results should be interpreted with caution.

The obtained results might be driven by outliers in the regions. That is, countries with exceptionally high or low corruption scores. To detect whether those outliers distort the results I will drop the top and bottom 5% of observations in the corruption variable and estimate the model again. Generally, the results (**Appendix E**) indicate a high robustness of the estimation, as eliminating the outliers does not considerably alter the results. Yet, a noticeable change can be observed in Asia. Eliminating the outliers leads to negative growth effects throughout all columns. Although still insignificant for overall GDP, the results question the robustness of the greasing the wheels effect of coordinated corruption in Asian countries. As for the other regions, the growth effect remains unchanged and negative for total GDP. Furthermore, except for the OECD countries, the regional growth effects remain mainly insignificant and are only subject to minor changes.

4.3. Baseline regression including resource rents

Table 7: Baseline regression including resource rents of at least 20% of the GDP

VARIABLES	(1) Total	(2) Resources	(3) Manufacturing	(4) Services
Corruption TI	-0.0637*	-0.0317	-0.0400	-0.0598
	(0.0338)	(0.0655)	(0.0423)	(0.0391)
Resource Rents 20%	-0.617***	-0.995***	-0.716**	-0.590***
	(0.164)	(0.242)	(0.325)	(0.195)
Corruption*Asia*Resources 20%	0.0406	0.237**	0.0791	0.0113
	(0.0689)	(0.0926)	(0.0945)	(0.0559)
Corruption*CA*Resources 20%	-0.426***	20.08***	-1.773**	-0.466***
	(0.105)	(2.973)	(0.826)	(0.110)
Corruption*LA*Resources 20%	-0.0101	-0.0569***	0.0139	-0.00987
	(0.0117)	(0.0177)	(0.0124)	(0.0102)
Corruption*MENA*Resources 20%	-0.0287	-0.0108	-0.0542*	-0.0670***
	(0.0185)	(0.0233)	(0.0278)	(0.0182)
Corruption*SSA Resources 20%	-0.209***	-0.383***	-0.200**	-0.191***
	(0.0470)	(0.0938)	(0.0853)	(0.0550)
Asia*Resources 20%	1.104***	2.476***	1.518***	0.899***
	(0.330)	(0.495)	(0.463)	(0.300)
CA*Resources 20%	-0.548*	50.47***	-3.710	-0.693**
	(0.318)	(7.291)	(2.400)	(0.349)
LA*Resources 20%	0.654***	1.024***	0.748**	0.604***
	(0.175)	(0.258)	(0.334)	(0.201)
MENA*Resources 20%	0.489**	0.946***	0.441	0.325
	(0.191)	(0.267)	(0.344)	(0.217)
Constant	8.143***	5.097***	6.133***	7.613***
	(0.178)	(0.255)	(0.176)	(0.188)
Observations	1,484	1,472	1,484	1,484
R-squared	0.870	0.744	0.745	0.872
Number of countries	129	128	129	129
Country FE	YES	YES	YES	YES
Region-Year FE	YES	YES	YES	YES
Additional Controls	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Finally, the hypothesis of the resource curse is examined. To measure the importance of resources for an economy, total natural resource rents are calculated as a percentage of total GDP.[15] Dummy variables at certain thresholds enable the division into being resource-rich or not (Carbonnier et al., 2010). For the purposes of this study I created two thresholds: the first at 10% resource rents (26% of observations), the second dummy at 20% resource rents (12% of observations). Besides measuring the

[15] Retrieved from the World Bank Open Data: "Total natural resources rents are the sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents."

effect of the resource rent dummy on a stand-alone basis, I created triple interaction terms comprising corruption, region and the resource rent dummy. **Table 7** presents the regression results[16] using the 20% threshold.

In line with previous findings, being a resource-rich country whose GDP is comprised of at least 20% resource rents impedes economic growth (Sachs & Warner, 1995), clearly underpinning the resource curse hypothesis. The results are highly significant not only for total GDP growth but also for each of the three sectors. On a regional level and in combination with corruption, the results are more heterogeneous. First, I will look at the triple interaction terms. Asia indicates a positive sign for both total GDP and throughout the sectors, implying that higher corruption fuels economic growth for resource-rich Asian countries. This finding is consistent with the findings in **Table 5**, further strengthening the hypothesis of the positive consequences of centralised corruption. Resource-richness does not seem to disrupt this mechanism. Yet, caution is advised as the results are not significant, except for the resource sector. The remaining regions all indicate negative relationships (the manufacturing sector in Latin America is positive but insignificant) between the effects of corruption and resource-richness on economic growth. An exceptional case is constituted by the resource sector of Central Asia, which again might be accredited to the limited data for that region. The results are most significant for Sub-Saharan Africa and Central Asia, followed by the MENA region and Latin America. Hence, increasing corruption in resource-rich countries across those four regions leads to an impediment of growth. The OECD region was omitted from the regression because there are no observations with at least 20% resource rents.

The results of the double interaction terms between the region and resource rents are very interesting.[17] Except for Central Asia, the three remaining regions (Asia, Latin America, MENA) show highly significant positive relations between resource-richness and economic growth. In fact, Sub-Saharan Africa indicates a significant negative sign as well, but the variable is dropped because of collinearity with the *Resource Rents 20%* variable. If I leave the *Resource Rents 20%* variable out of the above regression, the interaction term *SSA*Resources 20%* is included, highly significant and with a negative sign. Those results imply that the overall highly negative effect of the *Resource Rents 20%* variable is attributed mainly to the effect of Sub-Saharan Africa, as well as partly to the effect of Central Asia. On an aggregate level, the negative growth effects in those two regions thus appears to outweigh the positive growth effects in Asia, Latin America and MENA. Interestingly, both Latin America and MENA show a negative sign for the triple interaction term but a positive sign for the double interaction term. A possible explanation is that the negative growth effect of the resource curse is weaker than the

[16] For visualization purposes, not all variables included in the regression are depicted in **Table 7**.

[17] The interaction term *OECD*Resources 20%* is omitted again because there are no observations with resource rents of at least 20% in the OECD region.

negative growth effect of corruption. Furthermore, resource-richness might not be the trigger for bad economic performance but rather create an environment favourable for corruption which leads to the effects known as the resource curse. Certainly, more research should be carried out to shed light on those highly interesting but complex relationships.

Two robustness checks are carried out to validate the findings of **Table 7**. Again, the double interaction terms including Sub-Saharan Africa are dropped in both regressions because of collinearity. First, the regression is estimated with the 10% resource rents dummy, see **Appendix F**. To begin with, the 10% resource rents dummy is negative and highly significant, being in line with both the 20% rents and the resource curse theory. The results for the triple interaction terms of corruption, region and resource rents are very heterogeneous and differ in some respects from the previous regression. Asia, for example, shows negative signs throughout the columns, contradicting the theory that coordinated bribery greases the wheels, at least for resource-rich countries. In general, the results of the remaining regions are less consistent in comparison to the 20% threshold. It implies that the negative effects of corruption and resource-richness on growth are particularly significant for high resource dependency.

Using a resource-richness dummy bears the shortcoming that the coefficients are not comparable. Thus, a regression with a continuous variable for resource-richness is carried out in **Appendix G**. Generally, the results are much weaker and less significant than with the thresholds. Nevertheless, the central argument of resources negatively impacting economic growth is still valid. The services sector, however, is the only where this effect is still significant. Given the heterogeneity of countries in this sample (for example Norway and Iraq, both being resource-rich but very different in their corruption levels and economic situation), the insignificance of the resource rent effect is not surprising. Yet, the growth effects of corruption and resource-richness on total GDP are negative throughout all regions, including the OECD. The regional resource rent variables tend to exhibit disparate signs, however they are all insignificant for total GDP. Those findings are in line with both the 10% and 20% threshold regressions, whereas the negative effects of resource rents appear to be particularly distinct the greater the resource dependence.

5. Conclusion

Corruption is frequently accused to impede economic growth both directly (e.g. by increasing uncertainty) and indirectly (e.g. through weak political institutions). Aggregate empirical studies have failed, however, to consistently confirm a negative relationship between corruption and growth. A possible reason for those heterogeneities is the existence of sectoral specifics. As a consequence of those specifics, corruption might affect economic growth differently across sectors. Using panel data from 1995 to 2015, I reveal in this study that growth in the resource sector is unaffected by corruption, whereas it hampers growth in manufacturing and services. Furthermore, the growth effect on resources is insignificant throughout the examined regions. Hence, sectoral differences constitute a decisive factor in analysing the corruption-growth relationship and might partly explain the reasons for the heterogeneous findings in this field: A country whose economy is heavily dependent on resources might exhibit a positive relationship between corruption and overall economic growth. Cross-country and regional analyses fail to disclose this effect.

The negative growth effects of resource abundance, the so-called resource curse, is nowadays widely accepted and was also confirmed by this study. Yet, regional differences are distinct. The results imply that high resource rents tend to positively affect economic growth in Asia, Latin America and the MENA region. Extending the interaction between regions and resource rents with corruption, reveals that the combination of resource rents and increased corruption, however, is detrimental to growth for growth in Latin America and MENA. Those findings imply, that the negative growth effect of corruption is stronger in these regions than the negative growth effect of resource-richness.

Bearing in mind that I used an aggregate dataset,[18] the obtained results have to be considered preliminary and interpreted with caution. Yet, the findings of this study can be used to derive valuable policy implications. Most importantly, the results indicate that corruption generally impedes growth, except for the resources sector. Countries with scarce natural resources who are generating economic growth through manufacturing and services are thus strongly advised to continue fighting any form of corruption to promote economic growth. Simultaneously, the results should not be used to approve corruption in resource-rich countries. Although the economic impact of corruption might be limited, studies have shown that corruption leads to other negative consequences such as income inequality and poverty (Gupta et al., 2002).

There are certain limitations in my study that should be noted. To begin with, the main independent variable, corruption, is based on perceptions. The implications of this shortcoming are discussed in **Chapter 3.2.1.** in more detail. In the study at hand, a further weakness of the corruption indices accrues. The corruption indices don't distinguish between sectors but provide one score for the aggregate economy. Analysing the growth effect across sectors while applying a corruption measure for the economy as a whole is thus not entirely precise. In abstinence of a superior alternative, however, perception-based aggregate indices will remain the proxies of choice. Second, the effect of corruption on economic growth is most probably larger than estimated by the corruption variable (Gyimah-Brempong & de Camacho, 2006). The reason for this lays in the control variables of the applied growth equation (e.g. the quantity of investment in human and physical capital) of which many are significantly

[18] A more fine-grained dataset on e.g. firm level would be desirable.

affected by corruption (Treisman, 2000; Farrag & Ezzat, 2016). Hence, they act as transmission channels of corruption which may lead to an over-estimation of their effect on growth, while simultaneously lowering the magnitude of the corruption variable. Although this endogeneity issue is widely acknowledged (Mo, 2001; Pellegrini, 2011; Dridi, 2013), finding a solution is not easy as control variables that are needed to explain economic growth, are usually affected by corruption. A possibility is to identify the magnitude of the different transmission channels through which growth is affected by corruption, as done by Mo (2001) who has developed such a method. Third, reverse causality between corruption and growth might exist. That is, corruption might not only hamper economic growth, but poor income levels might in turn lead to increased corruption (Pellegrini, 2011). In fact, the importance of institutions in determining economic growth, paired with the persistence of institutions over time (Acemoglu et al., 2000), implies that corruption is also persistent over time; hence, corruption can be considered exogenous in growth equations (Pellegrini, 2011). However, the high correlation between corruption and economic growth in my sample might still (partly) be caused by reverse causality. Similarly, a study by Bai et al. (2013) finds that higher growth rates reduce corruption. The fourth limitation is closely connected to the two previous ones. In the presence of endogenous regressors, FE models might not produce consistent estimates (Gyimah-Brempong & de Camacho, 2006). As discussed in limitation number two, endogeneity issues among the variables are likely to occur in growth equations. The ideal solution would be the usage of an instrumental variable (IV) that isolates the exogenous variation, which is, however, hard to find. Fifth, establishing causality is very difficult. The reason lays in the corruption indices which only vary by year and country, making it impossible to add country-year FE. Adding several control variables constitutes at least a partial solution to that weakness. Yet, the inclusion of additional control variables reinforces the above-mentioned endogeneity problem. Besides, the problem of omitted variable bias remains also after the inclusion of certain control variables.

This study offers several implications for further research. Although the characteristics that distinguish sectors from each other are known (e.g. geographical bound for natural resources), it remains unclear which of those characteristics drive the disparate results across sectors. Also, the direction and magnitude of the characteristics is unknown. Shedding light on those interrelations could be an interesting array for future research. The conclusion that I draw regarding the triple interaction terms (corruption, region and resource rents), namely, that the negative growth effect of corruption outweighs the negative growth effect of resource-richness, should be further researched. To test this assumption, countries with similar corruption levels but different resource rents could be compared, as well as countries with different corruption levels but similar resource rents. The results should reveal whether the corruption or resource-rents are more detrimental to growth.

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Appendix A: List of countries, their region and CPI information

Country	Region	CPI range	CPI spread
Afghanistan	Asia	[0.8 - 2.5]	1.7
Armenia	Asia	[2.5 - 3.7]	1.2
Azerbaijan	Asia	[1.5 - 2.9]	1.4
Bangladesh	Asia	[0.4 - 2.7]	2.3
Bhutan	Asia	[5.0 - 6.5]	1.5
Brunei	Asia	[5.2 – 6.0]	0.8
Cambodia	Asia	[1.8 - 2.3]	0.5
Georgia	Asia	[1.8 - 5.2]	3.4
Hong Kong	Asia	[7.0 - 8.4]	1.4
India	Asia	[2.6 - 3.8]	1.2
Indonesia	Asia	[1.9 - 3.6]	1.7
North Korea	Asia	[0.8 – 1.0]	0.2
Lao PDR	Asia	[1.9 - 3.3]	1.4
Macao	Asia	[5.0 - 6.6]	1.6
Malaysia	Asia	[4.3 - 5.3]	1.0
Maldives	Asia	[2.3 - 3.3]	1.0
Mongolia	Asia	[2.6 - 4.3]	1.7
Myanmar	Asia	[1.3 - 2.2]	0.9
Nepal	Asia	[2.2 - 3.1]	0.9
Pakistan	Asia	[1.0 – 3.0]	2.0
Philippines	Asia	[2.3 - 3.8]	1.5
Russia	Asia	[2.1 - 2.9]	0.8
Singapore	Asia	[8.4 - 9.4]	1.0
Sri Lanka	Asia	[3.1 - 4.0]	0.9
Thailand	Asia	[2.7 - 3.8]	1.1
Timor-Leste	Asia	[2.2 - 3.3]	1.0
Kazakhstan	CA	[2.1 – 3.0]	0.9
Kyrgyz Republic	CA	[1.8 - 2.8]	1.0
Tajikistan	CA	[1.8 - 2.6]	0.8
Turkmenistan	CA	[1.6 - 2.2]	0.6
Uzbekistan	CA	[1.6 - 2.9]	1.3
Angola	SSA	[1.5 - 2.0]	0.5
Benin	SSA	[2.5 - 3.9]	1.4
Botswana	SSA	[5.4 - 6.5]	1.1
Burkina Faso	SSA	[2.9 - 3.8]	0.9
Burundi	SSA	[1.8 - 2.5]	0.7
Cabo Verde	SSA	[4.9 - 6.0]	1.1
Cameroon	SSA	[1.4 - 2.7]	1.3
Cent. Afr. Rep.	SSA	[2.0 - 2.6]	0.6
Chad	SSA	[1.6 - 2.2]	0.6
Congo, Dem. Rep.	SSA	[1.7 - 2.2]	0.5
Eritrea	SSA	[1.8 - 2.9]	1.1
Gambia, The	SSA	[1.9 - 3.5]	1.6
Ghana	SSA	[3.3 - 4.8]	1.5
Guinea	SSA	[1.6 - 2.5]	0.9
Guinea-Bissau	SSA	[1.7 - 2.5]	0.8
Kenya	SSA	[1.9 - 2.7]	0.8
Lesotho	SSA	[3.2 - 4.9]	1.7
Madagascar	SSA	[1.7 - 3.4]	1.7
Malawi	SSA	[2.7 - 4.1]	1.4
Mali	SSA	[2.7 - 3.5]	0.8
Mauritania	SSA	[2.3 - 3.1]	0.8
Mauritius	SSA	[4.1 - 5.7]	1.6
Mozambique	SSA	[2.2 - 3.5]	1.3
Namibia	SSA	[4.1 - 5.7]	1.6
Niger	SSA	[2.2 - 3.5]	1.3
Nigeria	SSA	[0.7 - 2.7]	2.0
Rwanda	SSA	[2.5 - 5.4]	2.9
Sao Tome & Prin.	SSA	[2.7 - 4.2]	1.5
Senegal	SSA	[2.9 - 4.4]	1.5
Seychelles	SSA	[3.6 - 5.5]	1.9
Sierra Leone	SSA	[1.9 - 3.1]	1.2
Somalia	SSA	[0.8 - 2.1]	1.3
South Africa	SSA	[4.1 - 5.7]	1.6
Sudan	SSA	[1.1 - 2.3]	1.2
Swaziland	SSA	[2.5 - 3.9]	1.4
Tanzania	SSA	[1.9 - 3.5]	1.6
Togo	SSA	[2.3 - 3.2]	0.9
Uganda	SSA	[1.9 - 2.9]	1.0
Zambia	SSA	[2.5 - 3.8]	1.3
Zimbabwe	SSA	[1.8 - 4.2]	2.4
Argentina	LA	[2.5 - 5.2]	2.7
Belize	LA	[2.9 - 3.8]	0.9
Bolivia	LA	[2.0 - 3.5]	1.5
Brazil	LA	[2.7 - 4.3]	1.6
Chile	LA	[6.1 - 7.9]	1.8
Colombia	LA	[2.2 – 4.0]	1.8
Costa Rica	LA	[4.1 - 6.5]	2.4
Cuba	LA	[3.5 - 4.8]	1.3
Ecuador	LA	[2.0 - 3.5]	1.5
El Salvador	LA	[3.4 - 4.2]	0.8
Guatemala	LA	[2.2 - 3.4]	1.2
Guyana	LA	[2.5 – 3.0]	0.5
Honduras	LA	[1.7 - 3.1]	1.4
Mexico	LA	[2.7 - 3.7]	1.0
Nicaragua	LA	[2.4 - 3.1]	0.7
Panama	LA	[3.0 - 3.9]	0.9
Paraguay	LA	[1.5 - 2.7]	1.2
Peru	LA	[3.3 - 4.5]	1.2
Puerto Rico	LA	[5.6 - 6.3]	0.7
Suriname	LA	[3.0 - 3.7]	0.7
Uruguay	LA	[4.1 - 7.4]	3.3
Venezuela, RB	LA	[1.7 - 2.8]	1.1
Algeria	MENA	[2.6 - 3.6]	1.0
Bahrain	MENA	[4.8 - 6.1]	1.3
Egypt	MENA	[2.8 - 3.7]	0.9
Iran	MENA	[1.8 - 3.0]	1.2
Jordan	MENA	[4.4 - 5.7]	1.3
Kuwait	MENA	[4.1 - 4.9]	0.8
Lebanon	MENA	[2.5 - 3.6]	1.1
Libya	MENA	[1.5 - 2.7]	1.2
Morocco	MENA	[3.2 - 4.7]	1.5
Oman	MENA	[4.5 - 6.3]	1.8
Qatar	MENA	[5.2 - 7.7]	2.5
Saudi Arabia	MENA	[3.3 - 5.2]	1.9
Syria	MENA	[1.7 - 3.4]	1.7
Tunisia	MENA	[3.8 - 5.3]	1.5
UAE	MENA	[5.2 - 7.0]	1.2
Palestine	MENA	[2.5 - 3.0]	0.5
Yemen	MENA	[2.1 - 2.6]	0.5
Australia	OECD	[7.9 - 8.9]	1.0
Austria	OECD	[6.9 - 8.7]	1.8
Belgium	OECD	[5.3 - 7.7]	2.4
Canada	OECD	[8.1 - 9.2]	1.1
Czech Republic	OECD	[3.7 - 5.6]	1.9
Denmark	OECD	[9.0 - 10.0]	1.0
Estonia	OECD	[5.5 - 7.0]	1.5
Finland	OECD	[8.9 - 10.0]	1.1
France	OECD	[6.3 - 7.5]	1.2
Germany	OECD	[7.3 - 8.3]	1.0
Greece	OECD	[3.4 - 5.4]	2.0
Hungary	OECD	[4.1 - 5.5]	1.4
Iceland	OECD	[7.8 - 9.7]	1.9
Ireland	OECD	[6.9 - 8.6]	1.7
Israel	OECD	[5.8 - 8.0]	2.2
Italy	OECD	[3.0 - 5.5]	2.5
Japan	OECD	[5.8 - 7.7]	1.9
Korea, Rep.	OECD	[3.8 - 5.6]	1.8
Latvia	OECD	[2.7 - 5.5]	2.3
Luxembourg	OECD	[8.0 - 9.0]	1.0
Netherlands	OECD	[8.3 - 9.0]	0.7
New Zealand	OECD	[9.0 - 9.6]	0.6
Norway	OECD	[7.9 - 9.1]	1.2
Poland	OECD	[3.4 - 6.2]	2.8
Portugal	OECD	[5.6 - 7.0]	1.4
Slovak Republic	OECD	[3.5 - 5.1]	1.6
Slovenia	OECD	[5.2 - 6.7]	1.5
Spain	OECD	[4.3 - 7.1]	2.8
Sweden	OECD	[8.7 - 9.5]	0.8
Switzerland	OECD	[8.4 - 9.1]	0.7
Turkey	OECD	[3.1 - 5.0]	1.9
United Kingdom	OECD	[7.4 - 8.7]	1.3
United States	OECD	[7.1 - 7.8]	0.7

Appendix B: Robustness check baseline regression with Corruption (WB)

VARIABLES	(1) **Total**	(2) **Resources**	(3) **Manufacturing**	(4) **Services**
Corruption WB	-0.144***	0.0874	-0.180***	-0.166***
	(0.0455)	(0.148)	(0.0520)	(0.0467)
Government Consumption	-7.99e-05	0.00709	0.00306	0.00208
	(0.00179)	(0.00604)	(0.00413)	(0.00299)
Capital Formation	0.00381**	0.00877*	0.00382**	0.00451***
	(0.00157)	(0.00506)	(0.00188)	(0.00163)
Population Growth	0.0157	0.0169	0.0250*	0.0132
	(0.01000)	(0.0168)	(0.0133)	(0.00896)
Inflation	-0.00164**	-0.00163	-0.00189*	-0.00202*
	(0.000809)	(0.00141)	(0.00103)	(0.00121)
FDI Inflow	0.0250***	0.0275*	0.0145	0.0264**
	(0.00914)	(0.0162)	(0.0110)	(0.0106)
Secondary School	0.000984	0.00103	0.00221	0.00138
	(0.00122)	(0.00277)	(0.00157)	(0.00133)
Constant	8.112***	4.963***	5.900***	7.480***
	(0.121)	(0.338)	(0.144)	(0.138)
Observations	1,480	1,467	1,480	1,480
R-squared	0.857	0.550	0.685	0.856
Number of countries	132	131	132	132
Country FE	YES	YES	YES	YES
Region-Year FE	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix C: Robustness check with Regulatory Quality and Political Stability

VARIABLES	(1) **Total**	(2) **Resources**	(3) **Manufacturing**	(4) **Services**
Regulatory Quality	0.167***	0.168*	0.106*	0.173***
	(0.0485)	(0.0996)	(0.0555)	(0.0499)
Political Stability	0.120***	0.0581	0.0976**	0.136***
	(0.0286)	(0.0815)	(0.0409)	(0.0324)
Government Consumption	0.000111	0.00738	0.00314	0.00228
	(0.00172)	(0.00614)	(0.00419)	(0.00288)
Capital Formation	0.00400***	0.00858*	0.00408**	0.00474***
	(0.00150)	(0.00489)	(0.00196)	(0.00152)
Population Growth	0.0131	0.00880	0.0256*	0.0107
	(0.00875)	(0.0174)	(0.0136)	(0.00799)
Inflation	-0.00122*	-0.00120	-0.00164*	-0.00157
	(0.000673)	(0.00135)	(0.000939)	(0.00103)
FDI Inflow	0.0186**	0.0192	0.0111	0.0196*
	(0.00870)	(0.0162)	(0.0113)	(0.00998)
Secondary School	0.00103	0.000886	0.00232	0.00143
	(0.00126)	(0.00266)	(0.00168)	(0.00140)
Constant	8.143***	5.006***	5.914***	7.514***
	(0.117)	(0.330)	(0.149)	(0.135)
Observations	1,480	1,467	1,480	1,480
R-squared	0.866	0.553	0.685	0.865
Number of countries	132	131	132	132
Country FE	YES	YES	YES	YES
Region-Year FE	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix D: Robustness check with 5-year averages

VARIABLES	(1) **Total**	(2) **Resources**	(3) **Manufacturing**	(4) **Services**
Corruption TI	-0.0418**	-0.00401	-0.0593***	-0.0415**
	(0.0198)	(0.0309)	(0.0226)	(0.0209)
Government Consumption	0.00211	0.00717*	-0.00110	0.00193
	(0.00218)	(0.00387)	(0.00296)	(0.00291)
Capital Formation	0.00687***	0.00631*	0.00642***	0.00716***
	(0.00202)	(0.00342)	(0.00228)	(0.00213)
Population Growth	0.00645	-0.00153	-0.00195	0.00621
	(0.0121)	(0.0166)	(0.0171)	(0.0112)
Inflation	-0.00207	-0.00147	-0.00197	-0.00259
	(0.00133)	(0.00187)	(0.00140)	(0.00183)
FDI Inflow	0.0337***	0.0218	0.0225**	0.0372***
	(0.00969)	(0.0135)	(0.0107)	(0.0107)
Secondary School	0.00201	0.000932	0.00170	0.00273*
	(0.00138)	(0.00225)	(0.00123)	(0.00151)
Constant	7.954***	5.443***	6.001***	7.324***
	(0.181)	(0.243)	(0.163)	(0.199)
Observations	1,491	1,479	1,491	1,491
R-squared	0.778	0.651	0.634	0.781
Number of countries	130	129	130	130
Country FE	YES	YES	YES	YES
Region-Year FE	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix E: Robustness check eliminating outliers (top and bottom 5%)

VARIABLES	(1) **Total**	(2) **Resources**	(3) **Manufacturing**	(4) **Services**
Corruption*Asia	-0.0438	-0.0478	-0.113**	-0.0422
	(0.0365)	(0.0449)	(0.0448)	(0.0432)
Corruption*CA	-0.0897**	0.0270	0.514**	-0.0177
	(0.0385)	(0.0344)	(0.221)	(0.0315)
Corruption*LA	-0.0202	0.0171	-0.0320	-0.00882
	(0.0438)	(0.0995)	(0.0523)	(0.0433)
Corruption*MENA	-0.0109	0.0403	-0.0294	-0.0414
	(0.0451)	(0.0462)	(0.0507)	(0.0529)
Corruption*OECD	-0.0793**	-0.0613	-0.104***	-0.0744**
	(0.0359)	(0.0490)	(0.0369)	(0.0360)
Corruption*SSA	-0.0594	-0.0525	-0.0168	-0.0537
	(0.0406)	(0.0779)	(0.0470)	(0.0440)
Constant	8.073***	5.426***	6.042***	7.486***
	(0.206)	(0.285)	(0.192)	(0.216)
Observations	1,355	1,344	1,355	1,355
R-squared	0.865	0.738	0.737	0.868
Number of countries	126	125	126	126
Country FE	YES	YES	YES	YES
Region-Year FE	YES	YES	YES	YES
Additional Controls	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix F: Robustness check including resource rents >10%

VARIABLES	(1) Total	(2) Resources	(3) Manufacturing	(4) Services
Corruption	-0.0529	0.00595	-0.0331	-0.0509
	(0.0320)	(0.0747)	(0.0494)	(0.0358)
Resource Rents 10%	-0.424***	-0.554*	-0.365*	-0.456***
	(0.151)	(0.319)	(0.211)	(0.172)
Corruption*Asia*Resources 10%	-0.00933	-0.208	-0.0543	-0.000982
	(0.0951)	(0.191)	(0.136)	(0.0939)
Corruption*CA*Resources 10%	-0.210*	0.284***	-0.182	-0.199***
	(0.124)	(0.105)	(0.472)	(0.0657)
Corruption*LA*Resources 10%	-0.0220*	0.0254	0.0222	-0.0367***
	(0.0112)	(0.0388)	(0.0261)	(0.0117)
Corruption*MENA*Resources 10%	0.0131	0.0117	0.0294	-0.0269
	(0.0861)	(0.0973)	(0.0777)	(0.108)
Corruption*OECD*Resources 10%	0.0672	-0.130*	0.131**	0.0665
	(0.0646)	(0.0734)	(0.0516)	(0.0675)
Corruption*SSA*Resources 10%	-0.116**	-0.251**	-0.0899	-0.107*
	(0.0480)	(0.110)	(0.0658)	(0.0553)
Asia*Resources 10%	0.456	-0.219	0.125	0.521
	(0.478)	(0.973)	(0.675)	(0.479)
CA*Resources 10%	-0.0410	0.838**	0.0873	0.0862
	(0.283)	(0.411)	(0.929)	(0.202)
LA*Resources 10%	0.468***	1.184***	0.495*	0.396**
	(0.161)	(0.401)	(0.262)	(0.181)
MENA*Resources 10%	0.351	0.607	0.325	0.233
	(0.373)	(0.463)	(0.397)	(0.436)
OECD*Resources 10%	1.102*	-0.374	1.551***	1.093*
	(0.558)	(0.692)	(0.503)	(0.581)
Constant	8.113***	5.508***	6.054***	7.590***
	(0.175)	(0.243)	(0.183)	(0.185)
Observations	1,484	1,472	1,484	1,484
R-squared	0.870	0.755	0.739	0.872
Number of countrynum	129	128	129	129
Country FE	YES	YES	YES	YES
Region-Year FE	YES	YES	YES	YES
Additional Controls	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix G: Robustness check with resource rents as a continuous variable

VARIABLES	(1) **Total**	(2) **Resources**	(3) **Manufacturing**	(4) **Services**
Corruption	-0.0470	0.0400	-0.0127	-0.0523
	(0.0327)	(0.0909)	(0.0459)	(0.0347)
Resource Rents	-0.0157	-0.0199	-0.0228	-0.0163*
	(0.0102)	(0.0158)	(0.0161)	(0.00979)
Corruption*Asia*ResRent	-0.00357	-0.00962	-0.00468	-0.00310
	(0.00425)	(0.00769)	(0.00802)	(0.00430)
Corruption*CA*ResRent	-0.0140	0.136***	-0.0465**	-0.0131**
	(0.0122)	(0.00598)	(0.0184)	(0.00564)
Corruption*LA*ResRent	-0.00233*	0.000317	0.00189	-0.00366**
	(0.00139)	(0.00251)	(0.00184)	(0.00171)
Corruption*MENA*ResRent	-0.000946	0.000145	-0.00211	-0.00368*
	(0.00211)	(0.00277)	(0.00226)	(0.00208)
Corruption*OECD*ResRent	-0.0256	-0.0386*	-0.0154	-0.0247
	(0.0211)	(0.0225)	(0.0210)	(0.0206)
Corruption*SSA*ResRent	-0.00397	-0.0128*	-0.00473	-0.00263
	(0.00264)	(0.00657)	(0.00394)	(0.00291)
Asia*ResRent	0.0287	0.0222	0.0366	0.0291
	(0.0198)	(0.0403)	(0.0299)	(0.0193)
CA*ResRent	-0.0277	0.319***	-0.0710	-0.0209
	(0.0294)	(0.0230)	(0.0571)	(0.0171)
LA*ResRent	0.0171	0.0693***	0.0361*	0.00623
	(0.0124)	(0.0234)	(0.0188)	(0.0134)
MENA*ResRent	0.0116	0.0314	0.00990	-0.00557
	(0.0146)	(0.0199)	(0.0198)	(0.0142)
OECD*ResRent	-0.180	-0.238	-0.114	-0.181
	(0.185)	(0.196)	(0.185)	(0.180)
Constant	8.148***	5.259***	6.173***	7.691***
	(0.158)	(0.238)	(0.181)	(0.168)
Observations	1,484	1,472	1,484	1,484
R-squared	0.873	0.759	0.745	0.875
Number of countries	129	128	129	129
Country FE	YES	YES	YES	YES
Region-Year FE	YES	YES	YES	YES
Additional Controls	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1