

# Influence of Extractive Revenue Disclosure on Control of Corruption: Are EITI implementers better than non-EITI-implementing counterparts?

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## Abstract

Corruption draws attention to the accountability practices of governments, especially as the prohibition of corruption within the public sector is ostensibly perceived as the foundation for minimising private sector corruption. This study examines the real effect of the Extractive Industries Transparency Initiative (EITI) and whether enlisting and implementing EITI standards over time translates into improved control of corruption in natural resource rich countries. Specifically, we investigate whether EITI membership makes a difference in terms of the control of corruption and whether the control of corruption in EITI-implementing countries declines with increased EITI implementation experience relative to pair-matched non-EITI-implementing countries. On the basis of 1,493 country-year observations for the period 2003 to 2017 across 111 natural resource rich countries, we find that EITI membership status on its own does not lead to improved control of corruption. However, our findings show that EITI implementation experience over time translates into improved control of corruption for EITI implementers compared to their matched non-EITI-implementing counterparts. Hence, for developing countries, joining the EITI appears to signal a commitment to reducing corruption, and the perception of corruption reduces with increasing experience. These findings are novel and in certain respects confirm the expectations underlying the establishment of the EITI.

**Keywords:** Corruption, EITI, EITI Implementation Experience, Developing Countries, Natural Resources, Extractive Revenue Accountability

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## I. Introduction

Society has long been concerned about accountability and corruption issues (Cannizzaro and Weiner, 2015; Changwony and Paterson, 2019). Governments, as the setters of rules and regulations, appear to assume that the prohibition of corruption within the public sector can serve as a bedrock for upholding high standards of integrity in private sector dealings (Rodriguez *et al.*, 2005; Mazzi *et al.*, 2019). The idea that state accountability facilitated by information disclosure is linked to a reduction in corruption has been the focus of several studies, but the results have been mixed (Corrigan, 2014; Sovacool and Andrews, 2015; Kasekende *et al.*, 2016; Sovacool *et al.*, 2016; Magno and Gatmaytan, 2017; Öge, 2016; Papyrakis *et al.*, 2017). Our focus is on the role international initiatives can play in promoting state accountability in the bid to increase good governance in resource-rich countries.

Undoubtedly, corruption hurts, and it hurts even more the poorest countries endowed with an abundance of natural resources yet lacking state accountability and good governance. The influence of natural resource rents in countries with an abundance of extractive resources has arguably impacted the overall corruption level of those countries. The literature on corruption provides examples of the undesirable effects of corruption on the economic well-being of citizens and its damaging impact on society (Cuervo-Cazurra, 2016; Kasekende *et al.*, 2016; Venables, 2016; Mazzi *et al.*, 2019). In particular, corruption is associated with natural resource abundance (Sachs and Warner, 1997; Pitlik *et al.*, 2010; Williams, 2011), a weak institutional framework (Kolstad and Wiig, 2009; Vadlamannati and Cooray, 2017), a lack of political transparency, and poor governance systems (La Porta *et al.*, 2000; Svensson, 2005; Magno and Gatmaytan, 2017).

In response to the concern about corruption and the need for transparency and accountability, especially in resource-rich countries, several international initiatives have emerged (Cannizzaro and Weiner, 2015; Changwony and Paterson, 2019; Cortese and Andrew, 2020).<sup>4</sup> One such initiative at the vanguard of transparency and accountability is the Extractive Industries Transparency Initiative (EITI). The EITI was established as a mechanism to reduce information asymmetry and corrupt practices in the management of natural resource revenue and thus enhance development in natural resource rich countries (Magno and Gatmaytan, 2017). The EITI has made significant strides in pushing for increased disclosure by extractive industries to facilitate accountability in resource-rich countries (Moses *et al.*, 2018; Cortese and Andrew, 2020). The demand for incremental financial and non-financial disclosure by both companies and countries, particularly in industries linked to natural resource extraction, is intensifying (Bui *et al.*, 2020; Chen *et al.*, 2016, 2019; Dhaliwal *et al.*, 2011; Goh *et al.*, 2020; Moses *et al.*, 2019). A number of factors, such as the growing

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<sup>4</sup> The collective actions of several international organisations have helped to expand the campaign for good governance and accountability in national governments' revenue management. Examples include Oxfam International, Publish What You Pay, Transparency International, and Global Witness.

influence of global corporations and the intensified scrutiny of extractive companies' impact on the environment, including the loss of citizens' trust in governments and corporations, have been regarded as being responsible for this growing demand (Bui *et al.*, 2020; Dhaliwal *et al.*, 2011; Moses *et al.*, 2019). Hence, there has been a call for more insights into disclosure practices in the extractive industry sector, especially at the country level, to better understand why policymakers elect to provide such disclosures (Goh *et al.*, 2020; Moses *et al.*, 2019). The question of whether incremental disclosures could be due to signalling or greenwashing motives by countries joining the EITI remains unresolved, especially as extant studies have demonstrated that disclosure of incremental information is able to attract additional resources to companies and countries in several ways (Bui *et al.*, 2020; Chen *et al.*, 2019; Kasekende *et al.*, 2016).

The debate over membership of international initiatives raises the question of the extent to which countries' membership of initiatives such as the EITI translates into national reform in terms of a reduction in the perceived level of corruption (Pitlik *et al.*, 2010; Ejiogu *et al.*, 2019). In this study, we question broadly whether joining the EITI and the implementation of EITI standards over time translate into improved control of corruption. Specifically, we explore the influence of EITI implementation experience on the level of corruption in countries implementing EITI standards. Our examination address two issues: (1) whether EITI membership makes a difference in terms of the level of corruption and (2) whether the control of corruption in implementing countries declines with increased EITI implementation experience. If a country's motivation to take EITI membership is based on incentives to access resources (Chen *et al.*, 2019; Kasekende *et al.*, 2016) that hitherto were out of its reach, then this may influence the country's decision to embark on a window-dressing exercise for EITI membership. Arguably, since countries could join the EITI to extract benefits rather than to pursue reform of national policy, it is likely that such countries would expose their extractive sector governance and management practices to severe scrutiny as they make additional disclosures of their extractive activities (Goh *et al.*, 2020). Alternatively, a government's publicly proclaimed accountability mechanism through the disaggregated disclosure of extractive industry information and the improved management of extractive revenue via the implementation of EITI standards over time should translate into benefits and as such decrease the level of corruption in the country.

Our study makes several significant contributions to the literature. First, our examination of the incremental impact of EITI experience on the perception of corruption contrasts with previous studies which have focused on the factors motivating countries to join the EITI at a specific time (Pitlik *et al.*, 2010; Williams, 2011; Corrigan, 2014; Kasekende *et al.*, 2016; Magno and Gatmaytan, 2017). In particular, research has not yet considered the discrete and joint effects of EITI membership and the duration (time) for which a country has been implementing EITI standards (i.e. implementation experience) on the control of corruption in

EITI-implementing countries. Second, we show that for developing countries who have joined the EITI, as compared to their propensity-score-matched non-EITI-implementing counterparts, implementing EITI standards over time (EITI implementation experience) appears to improve the control of corruption, thus answering the call for increased empirical findings in these under-represented jurisdictions with respect to sustainability concerns (Moses *et al.*, 2019, 2020). Third, and importantly, our ability to empirically examine the counterfactual situation of EITI membership and EITI implementation experience separately and jointly provide more refined and robust evidence on the influence EITI standards have on the control of corruption, something which is absent in the extant literature. These findings are novel and, indeed, in many respects confirm the motivation underlying the establishment of the EITI.

The rest of this paper is structured as follows. Section II provides the background and empirical setting of our study. Section III presents the literature review and hypotheses development. Section IV explains the research design, data, and estimation models of the study. Our results are presented in Section V, and in Section VI, we present our concluding remarks.

## II. Background and Empirical Setting

A growing body of studies (e.g. Svensson, 2005; Kolstad and Søreide, 2009; Venables, 2016) provide evidence on the failure of the governments of resource-rich countries to exploit their countries' extractive resource revenue for sustainable development. The situation is extreme for developing countries struggling with widespread public corruption (Moses *et al.*, 2019, 2020). The negative effect of resource rents on political institutions creates incentives for the poor management of natural resource revenue to support corrupt and rent-seeking behaviour (Mejía Acosta, 2013). Arguably, political accountability increases citizens' ability to punish corrupt politicians (Changwony and Paterson, 2019), and such increased public sector transparency and accountability is critical for effective financial management. The International Federation of Accountants (2015) acknowledges that

“governments are entrusted by citizens to manage public resources in an effective and efficient way. [...] This social contract between governments and citizens requires both parties to be accountable and to hold each other accountable. Timely, high-quality, decision-useful, and publicly available financial information is critical to governments fulfilling this stewardship role, and to citizens holding governments accountable”.

The EITI also holds the view that accountability through the transparent management of extractive revenues facilitates public trust and consequently reduces opportunities for corruption (EITI, 2015).

Established in September 2002 to counter poverty and corruption in resource-rich

countries (Papyrakis *et al.*, 2017; Moses *et al.*, 2018), the EITI requires governments and extractive companies operating in resource-rich countries to disclose information on their dealings in a manner that is externally verifiable by a third party. Essentially, the EITI's operational process requires the government of an implementing country to disclose revenues received from extractive companies, and in turn, extractive companies are required to publish payments made to the government. The revenue and payments are then reconciled by an auditor (termed the 'Independent Administrator' (IA)). The reconciliation allows the IA to compare the disclosed payments from a company with the government's recorded revenue receipts for the same company and thus draw public attention to (any) discrepancies.<sup>5</sup> Fundamentally, the EITI assumes that while disclosure is a valuable mechanism to signal trust by an EITI-implementing government via communication of their extractive revenue to citizens, such disclosures need to be credible (Chen *et al.*, 2016) if they are to achieve the anticipated outcome. It is for this reason that the role of the IA is crucial within the EITI's disclosure framework. Thus, the expectation is that EITI-adopting countries will become more transparent in their management of extractive revenue and build a defence against corruption. The decision to join the EITI rests on the government's willingness to sign up to EITI standards and to enact the enabling laws that drive the process. Membership of the EITI has grown steadily, with 51 implementing countries as of 2017 (EITI, 2017). Table 1 lists the EITI-implementing countries and their status.

**Table 1 EITI Countries' Status and Date of Commitment**

S/N	EITI Country	Status as of 2017 <sup>6</sup>	Commitment date <sup>7</sup>
1	Afghanistan	Candidate	2009
2	Albania	Compliant	2009
3	Azerbaijan	Candidate	2003
4	Burkina Faso	Compliant	2007
5	Cameroon	Compliant	2005
6	Central African Republic	Suspended	2007
7	Chad	Compliant	2007
8	Colombia	Candidate	2013
9	Cote d'Ivoire	Compliant	2007
10	Democratic Republic of Congo	Compliant	2005
11	Dominican Republic	Candidate	2015
12	Ethiopia	Candidate	2009
13	Germany	Candidate	2014
14	Ghana	Compliant	2003
15	Guatemala	Compliant	2010
16	Guinea	Compliant	2005

<sup>5</sup> Further discussion on the EITI and its operations is provided by Hilson and Maconachie (2008) and Pitlik *et al.* (2010).

<sup>6</sup> Globally, 51 implementing countries have signed up to the EITI, with 31 fully compliant as of 2017. However, two countries, the Central African Republic and Yemen, are currently suspended due to political instability and conflict.

<sup>7</sup> Year each country officially committed to the implementation of EITI standards and reporting.

17	Honduras	Candidate	2012
18	Indonesia	Compliant	2008
19	Iraq	Compliant	2009
20	Kazakhstan	Compliant	2005
21	Kyrgyz Republic	Compliant	2004
22	Liberia	Compliant	2007
23	Madagascar	Candidate	2006
24	Malawi	Candidate	2014
25	Mali	Compliant	2006
26	Mauritania	Compliant	2005
27	Mongolia	Compliant	2005
28	Mozambique	Compliant	2008
29	Myanmar	Candidate	2012
30	Niger	Compliant	2005
31	Nigeria	Compliant	2003
32	Norway	Compliant	2007
33	Papua New Guinea	Candidate	2013
34	Peru	Compliant	2005
35	Philippines	Candidate	2012
36	Republic of the Congo	Compliant	2005
37	Sao Tome and Principe	Candidate	2012
38	Senegal	Candidate	2012
39	Seychelles	Candidate	2013
40	Sierra Leone	Compliant	2006
41	Solomon Islands	Candidate	2012
42	Tajikistan	Candidate	2012
43	Tanzania	Compliant	2008
44	Timor-Leste	Compliant	2007
45	Togo	Compliant	2010
46	Trinidad and Tobago	Compliant	2010
47	Ukraine	Candidate	2009
48	United Kingdom	Candidate	2013
49	United States of America	Candidate	2011
50	Yemen	Suspended	2006
51	Zambia	Compliant	2007

(EITI, 2017)

### III. Literature

#### 3.1 Brief Conceptualisation of Corruption

We conceptualise corruption broadly as “*the abuse of public power for private benefit*” (Tanzi, 1998; O’Higgins, 2006). This definition emphasises aspects of public corruption such as monetary payments to government officials to induce them to ignore the interest of their citizens and favour the private interests of a bribe payer (Rose-Ackerman, 2002) or the disposal/misuse by government officials of public resources for personal gain (Shleifer and Vishny, 1993; Cuervo-Cazurra, 2016; Xue *et al.*, 2016; Mazzi *et al.*, 2019). Measuring corruption presents a severe challenge. The person offering a bribe or the recipient of a bribe would not publicly admit to those acts. Furthermore, while corruption is everywhere,

it is not the same everywhere (Rodriguez *et al.*, 2005); thus, the notion of what constitutes corruption varies across jurisdictions and cultures, making it difficult to find a *one-size-fits-all* measure of corruption (Rodriguez *et al.*, 2005; Svensson, 2005). Hence, corruption tends to be measured by the *perception of corruption* (Melgar *et al.*, 2010).

There is an unresolved debate on the relationship between actual and perceived corruption. Houqe and Monem (2016) argue that the relationship between the level of actual corruption and the perception of corruption can be complex, with actual corruption affecting the perception of corruption in a country. On the other hand, perception can also influence the actual level of corruption as some people may act corruptly on the basis of the belief that others are engaging in similar (corrupt) behaviour (Melgar *et al.*, 2010; Heywood, 2015). Our paper does not address this debate; rather, we simply adopt a measure of perceived corruption as a proxy for government corruption.

### 3.2 EITI Effectiveness and the Control of Corruption

The studies that have linked EITI implementation to the reduction of corruption include Ölcer (2009), Kolstad and Wiig (2009), Pitlik *et al.* (2010), Aaronson (2011), Corrigan (2014), Kasekende *et al.* (2016), and Papyrakis *et al.* (2017). Ölcer (2009) examines the operations of the EITI and finds EITI countries to be worse than non-EITI resource rich countries in terms of their control of corruption. As part of a set of suggested strategies to strengthen the Initiative, Ölcer has called for developed countries to join the EITI. This call has been answered in recent years, with Norway, the United States,<sup>8</sup> the United Kingdom, and Germany officially committing to the EITI. Other developed countries that have made steps towards adopting the EITI include Australia, which announced its intention to implement EITI standards in 2016 but has yet to do so, and Canada, which has yet to join the EITI but has legislated EITI disclosures via its Extractive Sector Transparency Measures Act 2014 (Moses *et al.*, 2018). A critical limitation of Ölcer's (2009) study is the early stage of EITI adoption at the time of the study which perhaps could have influenced the study's results.

Kolstad and Wiig (2009) argue that information disclosure as pursued by the EITI may not necessarily lead to better control of corruption. They conclude that the impact of transparency depends on the level of literacy, the extent to which stakeholders have access to information, and the ability to influence effective financial management practices. Aaronson (2011) examines EITI effectiveness on the basis of its multi-stakeholder arrangement and finds its effectiveness to be limited by the different interests of the three stakeholders (governments, companies, and civil society organisations (CSOs)). The study suggests that the EITI is generally accepted as a signal for control of corruption but is weak in terms of enforcing accountability due to CSOs' limited access to information. Corrigan (2014) finds that the EITI has helped countries achieve improvements in terms of natural resources

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<sup>8</sup> The United States later withdrew its membership (on 2 November 2017).

benefiting all. However, the effect of EITI membership on the control of corruption remains unclear. The author argues that if joining the EITI is a sign of a country's willingness to reform, then membership should lead to improvement in terms of both economic and governance indicators.

Kasekende *et al.* (2016) investigate factors that lead a country to join the EITI and whether membership leads to improved control of corruption. They find that the countries that are more likely to join the EITI are those that are corrupt, attract greater shares of foreign direct investment, and have lower gross domestic product (GDP) per capita. These findings lead to the suspicion that some poor resource-rich countries may join the EITI as a window-dressing exercise in order to access funds from foreign donors and international financial support from organisations such as the World Bank and the IMF. Overall, Kasekende *et al.* (2016) find no evidence that the EITI has led to a reduction in the level of corruption. In contrast, Papyrakis *et al.* (2017) find that resource-rich countries that have joined the EITI experience an increase in corruption. However, the increase is not more than that experienced by non-EITI countries. Although a departure from prior findings, the findings of Papyrakis *et al.* (2017) are not surprising as national reforms do not necessarily yield immediate results. Pitlik *et al.* (2010) confirm that the decision to join the EITI, which can signal a government's intention to reform, should practically translate into measurable results only in the long term. In line with Pitlik *et al.*'s (2010) expectation, the findings of Papyrakis *et al.* (2017) suggest that resource-rich countries could, over time, improve their control of corruption and the management of extractive revenue via implementation of EITI standards, an assumption that demands empirical testing and which our research attempts to address.

### 3.3 Theoretical Development and Hypotheses

The citizen-government relationship can be conceptualised as a principal-agent relationship; consequently, asymmetry regarding extractive revenue information is of concern to citizens. The extent of the information asymmetry between government and citizens is a major obstacle (Chen *et al.*, 2016, 2019) in the agency relationship and suggests the crucial role mitigation factors could play. In this regard, the commitment of governments of poor resource-rich countries to a detailed extractive sector disclosure via implementation of EITI standards in order to reduce the information asymmetry between them and their citizens and to signal their future performance (Bui *et al.*, 2020; Chen *et al.*, 2016, 2019) with respect to their efforts to control corruption could help to mitigate this agency concern. Lack of transparency gives rise to conflict between principal and agent, particularly where it is difficult for citizens to monitor their government's activities (Bale and Dale, 1998; Kolstad and Wiig, 2009). One way in which citizens living in countries with a high level of extractive revenue information asymmetry can improve the control of corruption is to demand increased disclosure of revenue information from their government. Vadlamannati and Cooray (2017) explain that citizens' rights to be informed about their government's use of their taxes and



allocation of public and natural resources reflect the level of the public's anti-corruption concerns. Thus, access to government information by the public is critical in facilitating accountability, especially in resource-rich developing countries. In practice, this may be difficult, and that is where a country's adoption of EITI standards may offer an alternative approach that overcomes the inadequacies of traditional accountability by the bureaucracy.

Another response to the agency problem is monitoring which enables the principal to be aware of the activities of the agent for reward and disciplinary purposes. This could be a better mechanism for the citizen-government relationship to deliver optimum results. Hence, improved transparency through information disclosure concerning government financial conduct increases openness in extractive revenue accountability, which strengthens citizens' capacity to monitor the government. Intuitively, a decrease in extractive revenue opacity increases the feasibility of accountability in the citizen-government relationship since citizens would expect elected politicians to make full disclosures of how resources entrusted to them are generated and utilised (IFAC, 2015).

The debate over whether countries could join the EITI as a window-dressing exercise is unresolved and worthy of empirical assessment in order to understand whether EITI standards can enforce natural resource revenue accountability and thus influence the control of corruption positively. Generally, the absence of accountability and monitoring premised on transparent information disclosure arguably increases the potential for corruption in a country. Nevertheless, a public unequivocal commitment to implementing EITI standards exposes governments to higher scrutiny (Goh *et al.*, 2020) by national and international organisations interested in promoting good governance. The expectation is that countries that commit to the EITI will publicly disclose all information, as stipulated by EITI standards, necessary for instilling transparent stewardship in their extractive industries (EITI, 2015). However, if a country's decision to join the EITI is ill-motivated, being either a façade or a means to access support that hitherto was out of a country's reach, then that country's EITI membership status would not change the governance practices in the country and thus could not improve the control of corruption.

Again, the possibility that some countries joined the EITI for window dressing should be evident in the limited progress of such countries, including their failure to improve their control of corruption. The EITI warns against this behaviour and hints that countries that pursue this path will be sanctioned via its internal validation assessment process. Fundamentally, our argument in this regard is that countries' membership of the EITI is not necessarily a factor for improved control of corruption. Consequently, until and unless an EITI member country commits to full information disclosure coupled with accountability oversight from the EITI, their EITI membership status will not translate into better control of corruption. Consistent with this expectation, we propose the following hypothesis:

**H<sub>1</sub>: EITI membership status is not associated with better control of corruption.**

The follow-up on our first hypothesis is that mere ticking of the membership box is insufficient for an EITI-implementing country to mitigate corruption and must be accompanied by other steps to deliver the intended results. Our argument is that given the presence of strong accountability through the application of the EITI implementation process and, most importantly, the cumulative experience from implementing EITI standards, countries should achieve improved control of corruption, *ceteris paribus*. Furthermore, the effect of public sector reforms, particularly those intertwined with accountability, requires effective monitoring and the passage of time before the anticipated impact is likely to be perceptible (Pitlik *et al.*, 2010). Hence, we predict that a country's EITI membership combined with the length of time it has been implementing EITI standards (i.e. EITI implementation experience) should be associated with improved scores for control of corruption, *ceteris paribus*. We thus hypothesise the following:

**H<sub>2</sub>: EITI implementation experience is associated with better control of corruption in EITI-implementing countries compared with non-EITI-implementing countries.**

The core objective of the EITI is to help reduce the negative impact of corruption on the financial management of the extractive revenue of poor resource-rich countries. Accordingly, increasing experience of implementing EITI standards should result in better control of corruption for countries with the most critical need for national reform. In this case, we expect developing countries with greater EITI implementation experience to obtain more benefit from EITI implementation experience, compared with non-EITI-implementing countries. This is particularly the case as developing countries have been documented to have issues managing their natural resources wealth as well as keeping corruption under control (Kasekende *et al.*, 2016; Moses *et al.*, 2019, 2020; La Porta *et al.*, 2000; Williams, 2011).

## IV. Research Design

### 4.1 Sample and Data

Our full estimation sample is comprised of 1,493 country-year observations covering 51 EITI-implementing countries and 60 non-EITI-implementing *developing countries classified as having natural resource dependence* over the sample period (2003-2017). We restrict the sample to developing countries (i.e. we exclude the four OECD EITI implementing countries from our sample).<sup>9</sup> Our selection criterion for natural resource dependence is based on an estimated threshold of each country's total natural resource rents as a percentage of GDP.<sup>10</sup> Natural resource rent dependence for developing countries applies where natural resources contribute a sizeable but not necessarily dominant input into GDP (Öge, 2016; Corrigan, 2017;

<sup>9</sup> These are Germany, Norway, the United Kingdom, and the United States.

<sup>10</sup> Total natural resources rents are the sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents.

Magno and Gatmaytan, 2017). We apply a level of 2.5% and above as our threshold for inclusion. Our estimation procedure begins with the computation of a 15-year average (over 2003-2017) for each sampled developing country's total natural resource rents as a percentage of the country's GDP. Next, we rank countries and identify those meeting our selection criterion (i.e. those with an average of 2.5% and above). We specify our sample period to commence in 2003, when the first set of countries officially committed to the EITI, and to end in 2017, the last date for which complete annual country data for countries are available from the different sources used in our analyses.

## 4.2 Statistical Procedures

In testing our hypothesis on whether countries implementing EITI standards are more likely to improve their control of corruption compared to non-implementing countries, we face the possible risk of selection bias. The selection bias problem arises primarily because our sample of implementing countries differs from non-implementing countries for reasons other than their EITI membership status. Furthermore, since our assignment of EITI member (treatment) and non-EITI member (control) groups is not random, we assume the probable existence of selection bias, which could result from confounding factors. One suggested approach to minimise this risk is to adopt a matching procedure (Shen and Chang, 2009; Lin, 2019). In this study, the matching technique eliminates bias by pairing EITI members with non-EITI members that have similar observed characteristics. Specifically, we use propensity score matching (PSM), as proposed by Rosenbaum and Rubin (1983), to control for the existence of confounding factors on the basis of the idea that the selection bias is reduced when the comparison of outcomes is performed using treated and control subjects who are as similar as possible.

In our case, an average treatment effect (ATE) is an appropriate statistical procedure to use (see Lin, 2019; Shen and Chang, 2009). ATE allows us to compare two possible outcomes for the same unit: that is, when our interest variable is treated and when it is not treated. Essentially, the ATE of the outcome variable in the population of interest can be expressed as  $ATE = [Y_1 - Y_0]$ , where  $Y_1$  is the outcome variable with treatment and  $Y_0$  is the outcome variable without treatment (Imbens and Wooldridge, 2009; Lin, 2019). A key limitation of this causal inference is the inability to observe counterfactual outcomes. Since assignment to the treatment is mutually exclusive, we can only observe what happens if treatment occurs ( $Y_1$ ) or if treatment does not take place ( $Y_0$ ), not both at the same time. However, this limitation is appropriately addressed statistically with the PSM technique.

We identify two benchmark groups: (i) "non-EITI-implementing countries", which consist of 60 developing countries identified as having natural resource dependence, with 772 country-year observations; and (ii) "EITI-implementing countries", which consist of 47 developing countries and four developed countries that have adopted EITI rules, with 721 country-year observations for the full sample. We exclude the four developing countries from

our alternative tests to ensure that the countries in our sample and the countries they are paired with are as homogenous as possible. Thus, we use PSM to generate the control countries with similar predicted attributes to estimate whether countries implementing EITI standards are more effective in improving their control of corruption than their PSM-matched non-EITI-implementing counterparts.<sup>11</sup>

### 4.3 Test Model

We employ the following general model to test the impact of EITI implementation experience on the perception of corruption:

$$\begin{aligned}
 CCI_i = & \alpha_0 + \alpha_1 M_{EITI_i} + \alpha_2 T_{EITI_i} + \alpha_3 MT_{EITI_i} + \alpha_4 NRR_i + \alpha_5 \ln GDP_i \\
 & + \alpha_6 FOI_i + \alpha_7 HEXgdp_i + \alpha_8 MERgdp_i + \alpha_9 \ln POP_i + \alpha_{10} RQ_i \\
 & + \alpha_{11} RL_i + \alpha_{12} FDIgdp_i + \alpha_{13} DISC_i + Year FE \\
 & + Continent FE + \varepsilon_i
 \end{aligned} \tag{1}$$

where:

$CCI_i$	= Measure of the control of corruption
$M_{EITI_i}$	= EITI membership indicator variable
$T_{EITI_i}$	= Measure of time of EITI operations (2003-2017)
$MT_{EITI}$	= Interaction term of EITI membership and time of EITI operations
$NRR_i$	= Level of resource revenue dependence. This variable is measured as aggregate natural resource rents (NRR) in the main model and alternatively as mineral rents ( <i>MIN</i> ) and oil rents ( <i>OIL</i> ) in our robust specifications.
$\ln GDP_i$	= Natural logarithm of GDP per capita current
$FOI_i$	= Duration for which a country has adopted freedom of information (FOI) law
$HEXgdp_i$	= Health expenditure per capita
$MERgdp_i$	= National merchandise trade (% of GDP)
$\ln POP_i$	= Natural logarithm of population
$RQ_i$	= Regulatory quality
$RL_i$	= Rule of law
$FDIgdp_i$	= Foreign direct investment, net inflows (% of GDP)
$DISC_i$	= Disclosure – business extent of disclosure index
$Year FE$	= Year fixed effect
$Continent FE$	= Continent fixed effect
$\varepsilon_i$	= Error term

Table 2 provides definitions of the variables and describes the data sources.

<sup>11</sup> The statistical procedure yields a control group of “PSM non-EITI-implementing countries”, which consists of developing countries with identified natural resource dependence and that are propensity-score-matched based on characteristics that typify the treatment group of EITI implementing countries. In conducting our test, we set the parameter for the estimation to allow for “PSM non-EITI-implementing countries” to be drawn with replacement.

**Table 2 Variable Descriptions and Data Sources**

Code	Variable Name	Description	Source
<i>CCI</i>	Control of Corruption Index (measure of the perceived level of corruption)	The <i>CCI</i> is the Control of Corruption Index, which measures the perception of whether public power is exercised for private gain, including both petty and grand forms of corruption, and the capture of the state by elites and private interest. Higher values indicate better control of corruption.	Worldwide Governance Indicator and Kaufmann <i>et al.</i> (2011).
<i>M_EITI</i>	EITI membership	<i>M_EITI</i> is a dichotomous variable that takes the value of 1 if a country is an EITI-implementing country and zero otherwise	Estimated using information obtained from EITI website <a href="https://eiti.org">https://eiti.org</a>
<i>T_EITI</i>	Time since the EITI has been in existence	<i>T_EITI</i> is a measure of time of EITI operations, from 2003 to the present.	Estimated using information obtained from EITI website <a href="https://eiti.org">https://eiti.org</a>
<i>MT_EITI</i>	Interaction term of EITI membership and existence	This variable is the product of <i>T_EITI</i> and <i>M_EITI</i> .	Estimated using information obtained from EITI website <a href="https://eiti.org">https://eiti.org</a>
<i>NRR</i>	Natural resource revenue dependence	<i>NRR</i> is the natural resource revenue dependence level of a country and is measured as total natural resource rents as a percentage of GDP.	World Bank <a href="http://www.worldbank.org">www.worldbank.org</a>
<i>MIN</i>	Mineral rents (% of GDP)	<i>MIN</i> is mineral rents, measured as the difference between the value of production for a stock of minerals at world prices and their total costs of production expressed as a percentage of GDP. Minerals included in the calculation are tin, gold, lead, zinc, iron, copper, nickel, silver, bauxite, and phosphate	World Bank <a href="http://www.worldbank.org">www.worldbank.org</a>
<i>OIL</i>	Oil rents (% of GDP)	<i>OIL</i> is oil rents, measured as the difference between the value of crude oil production at world prices and total costs of production.	World Bank <a href="http://www.worldbank.org">www.worldbank.org</a>
<i>lnGDP</i>	Gross domestic product	GDP is the natural logarithm of gross domestic product per capita. GDP per capita (current US\$) is gross domestic product divided by midyear population.	World Bank national accounts data <a href="http://www.worldbank.org">www.worldbank.org</a>
<i>FOI</i>	Freedom of information	<i>FOI</i> is the duration for which a country has adopted FOI laws, measured as the cumulative number of years since the enactment of the law.	Freedominfo.org <a href="http://www.freedominfo.org">http://www.freedominfo.org</a>

<i>HEXgdp</i>	Health expenditure	This is measured as the current health expenditure per capita (current US\$).	World Bank <a href="http://www.worldbank.org">www.worldbank.org</a>
<i>Mergdp</i>	Merchandise trade (% of GDP)	Merchandise trade as a share of GDP is the sum of merchandise exports and imports divided by the value of GDP, all in current US dollars.	World Bank <a href="http://www.worldbank.org">www.worldbank.org</a>
<i>lnPOP</i>	Population	Country's total population per year.	World Bank <a href="http://www.worldbank.org">www.worldbank.org</a>
<i>RQ</i>	Regulatory quality	Regulatory quality captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. Estimate gives the country's score on the aggregate indicator in units of a standard normal distribution (i.e. ranging from approximately -2.5 to 2.5).	World Bank Worldwide Governance Indicator (WGI) project <a href="http://www.worldbank.org">www.worldbank.org</a> and Kaufmann <i>et al.</i> (2011)
<i>RL</i>	Rule of law	Rule of law captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. Estimate gives the country's score on the aggregate indicator in units of a standard normal distribution (i.e. ranging from approximately -2.5 to 2.5).	World Bank Worldwide Governance Indicator (WGI) project <a href="http://www.worldbank.org">www.worldbank.org</a> and Kaufmann <i>et al.</i> (2011)
<i>FDIgdp</i>	Foreign direct investment, net inflows (% of GDP)	Foreign direct investment is the net inflows of investment to acquire a lasting management interest (10% or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital, as shown in the balance of payments. This series shows net inflows (new investment inflows less disinvestment) in the reporting economy from foreign investors and is divided by GDP.	World Bank <a href="http://www.worldbank.org">www.worldbank.org</a>
<i>DISC</i>	Disclosure - business extent of disclosure index	Disclosure index measures the extent to which investors are protected through disclosure of ownership and financial information. The index ranges from 0 to 10, with higher values indicating more disclosure.	World Bank, Doing Business project ( <a href="http://www.doingbusiness.org">http://www.doingbusiness.org</a> )

#### 4.4 Dependent Variable

We measure the level of corruption by the Control of Corruption Index (CCI; Kaufmann *et al.*, 2011). This index captures perceptions of the extent to which public power is exercised for private gain, including petty and grand forms of corruption, as well as the ‘capture’ of the state by elites and private interests. The index gives a country’s score in units of a standard normal distribution ranging from approximately -2.5 to 2.5, with higher scores denoting better control of corruption (i.e. perceived as a less corrupt country). We choose this measure of the perception of corruption rather than other measures, such as the Corruption Perception Index (CPI) published by Transparency International, for three reasons: (1) its completeness over our sample period; (2) 31 unique data sources are used to construct the CCI, as against 12 sources used for the CPI (Kaufmann *et al.*, 2011; Houqe and Monem, 2016); (3) most importantly, the CPIs for 2012 and earlier years are not comparable for time series estimation. Specifically, Transparency International emphasises that given the changes to the methodology, country scores for the 2012 CPI cannot be compared against those of 2011 or previous editions. However, year to year comparison is possible from 2012 onwards.

#### 4.5 Independent (Explanatory) Variables

EITI membership ( $M\_EITI$ ) is one of the explanatory variables of interest in our study, and it is measured as an indicator variable that denotes whether a country participates as an EITI implementer or not. The second variable of interest in the study is the *time* for which the EITI has been in operation ( $T\_EITI$ ), which provides a measure of the existence of the EITI. The main explanatory variable for the study is the interaction term for EITI membership and the time for which the EITI has been in operation ( $MT\_EITI$ ). The interaction term enables us to observe the effect of EITI implementation experience on the control of corruption for each country. Essentially, it captures the cumulative experience (duration) that an EITI-implementing country has had since enlisting to implement EITI standards. Thus, the interaction term indicates how the duration of a country’s membership of the EITI impacts the control of corruption in implementing countries.

#### 4.6 Control Variables

The control variables employed in the tests have been found in the literature to correlate with the dependent variable. The level of natural resource revenue dependence indicates the natural resource revenue dependence in a country and is measured using three different parameters. First, we use countries’ total natural resource rents ( $NRR$ ) as the main measure for resource revenue dependence in all of our test specifications. The  $NRR$  is the aggregate natural resource revenue dependence level of a country and is measured as total natural resource rents as a percentage of GDP.  $NRR$  takes into account all rents emanating from natural resources and thus is the sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents (Jović *et al.*, 2016). In our robustness and supplementary tests,

we use mineral rents (*MIN*) and oil rents (*OIL*) as alternative measures of natural resource dependence. *MIN* is measured as the difference between the value of production for a stock of minerals at world prices and their total costs of production (minerals included in the calculation are tin, gold, lead, zinc, iron, copper, nickel, silver, bauxite, and phosphate), and *OIL* is measured as the difference between the value of crude oil production at world prices and total costs of production. These variables have been used in the literature to explain that, given a certain revenue threshold and extractive resource type, resource dependence can have a positive effect for developed countries akin to the negative effect of corruption on developing countries (Corrigan, 2014; Kasekende *et al.*, 2016; Okada and Samreth, 2017; Papyrakis *et al.*, 2017).

The natural logarithm of GDP per capita (*GDP*) of each country is included following previous findings that the economic development of countries impacts the level of governance (Pitlik *et al.*, 2010; Corrigan, 2014; Jović *et al.*, 2016; Papyrakis *et al.*, 2017). Duration of FOI law (*FOI*) accounts for the length of time a country has adopted FOI law. FOI laws supposedly empower citizens to question the activities of their governments and can facilitate the unearthing of corruption (Vadlamannati and Cooray, 2017). In addition, the existence of FOI law has been acknowledged to be an important mechanism for providing data on national issues that were previously inaccessible (Hazelton, 2013). We include each country's current percentage of health expenditure to GDP (*HEXgdp*) to control for government spending on health in the sampled countries. While it is unclear whether higher health expenditure necessarily leads to better health outcomes (Xu *et al.*, 2010), an effective health system requires a certain minimum level of resourcing from the national government. Thus, governments that prioritise health care as part of good governance practices may arguably be perceived as less corrupt. In fact, empirical evidence suggests that corruption alters public spending structure and resource allocation at the expense of critical issues such as health care (Shleifer and Vishny, 1993; Delavallade, 2006; Swaleheen *et al.*, 2019). The expectation, therefore, would be that higher health expenditure should reflect improved *CCI* scores. Merchandise trade as a percentage of GDP (*MERGdp*) is included as well due to its ability to capture the overall trade effect in the sampled country. Merchandise trade as a share of GDP is measured as the sum of merchandise exports and imports divided by the value of GDP, all in current US dollars.

Following prior literature, we control for country size by the natural logarithm of the population (*lnPOP*), which has been found to be associated with country-level corruption (Pitlik *et al.*, 2010; Changwony and Paterson, 2019). Furthermore, and consistent with Chen *et al.* (2014), we include other controls:

1. Regulatory quality (*RQ*), which captures the ability of governments to formulate and implement sound policies and regulations that permit and promote private sector development.



2. Rule of law (*RL*), based on the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence in a country.
3. Foreign direct investment (*FDI*), measured as the net inflows of investment to acquire a lasting management interest (10% or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments. This series shows net inflows (new investment inflows less disinvestment) in the reporting economy from foreign investors and is divided by GDP.
4. Disclosure - business extent of disclosure index (*DISC*), reflecting the extent to which investors are protected through disclosure of ownership and financial information.

## V. Empirical Results

### 5.1 Descriptive Statistics

Our empirical analysis begins with the sampled countries' summary statistics, which are reported in Table 3. The summary data report each country's EITI membership status and their mean *CCI*, *NRR*, *OIL*, *MIN*, *lnGDP (per capita)*, *FOI*, *HEXgdp*, *MERGdp*, *lnPOP*, *RQ*, *RL*, *FDI**gdp*, and *DISC* over the sampled period. Equatorial Guinea has the lowest mean *CCI* score (-1.63) across the sampling period, while Norway, with an average of 2.10, is the country in the sample with the best control of corruption score. In terms of EITI implementers' average natural resource revenue dependency (*NRR*) levels, Iraq, with an average of 48.63%, is the country with the highest proportion of *NRR* within the sample. This in some respects explains why countries like Iraq would favour membership of the EITI (Corrigan, 2014; Öge, 2016). Among all EITI-implementing countries, Norway has the highest average GDP per capita (US\$ 88,831.6) over the sampling period, while the Democratic Republic of Congo has the lowest (US\$ 347.22). China, with an average of 1,337 million, is the most populous country in the sample; however, it is the United States, with an average of 308 million, that has the greatest population among the EITI implementers. The United States also has the longest average period for implementing *FOI* law, with an average of about 45 years. Finally, the countries with the highest average for rule of law and regulatory qualities are Norway (1.95) and the United Kingdom (1.74), respectively.

Table 4 reports the detailed descriptive statistics for the full sample for all the variables employed in our tests. The *CCI* mean (median) score of -0.48 (-0.68) suggests that, on average, the countries sampled are perceived to have corruption issues. The differential between the

Table 3 Sampled Countries' Means of Test Variables

Country Name	M	EITI	CCI	NRR	OIL	MIN	GDPpc	POP2 (mil)	FOI	RL	RO
Afghanistan	1		-1.48	0.56	0.02	0.00	491.67	29.18	0.67	-1.69	-1.43
Albania	1		-0.64	1.99	1.55	0.31	3832.72	2.94	11.50	-0.53	0.06
Algeria	0		-0.58	27.10	23.26	0.12	4443.56	36.20	0.00	-0.75	-0.93
Angola	0		-1.36	30.53	29.86	0.00	3296.41	22.69	7.83	-1.30	-1.08
Argentina	0		-0.41	3.76	2.78	0.42	9733.94	41.26	7.00	-0.63	-0.73
Armenia	0		-0.62	2.71	0.00	2.51	3314.92	2.93	8.00	-0.38	0.25
Azerbaijan	1		-1.06	29.56	26.58	0.07	4970.97	9.03	6.07	-0.78	-0.40
Bahrain	0		0.23	6.47	3.54	0.00	21702.93	1.17	0.00	0.47	0.68
Belize	0		-0.24	3.11	2.75	0.00	4347.26	0.33	17.50	-0.44	-0.41
Benin	0		-0.60	5.25	0.03	0.00	790.73	9.63	0.00	-0.56	-0.46
Bhutan	0		0.94	3.76	0.00	0.03	2069.48	0.72	0.00	0.30	-0.79
Bolivia	0		-0.62	10.48	3.87	2.91	2058.60	9.98	0.00	-0.97	-0.76
Botswana	0		0.97	4.36	0.00	3.66	6522.31	2.03	0.00	0.64	0.55
Brazil	0		-0.12	4.37	1.80	2.01	10686.65	196.51	1.87	-0.20	0.02
Brunei Darussala	0		0.54	27.41	20.26	0.00	3533.81	0.39	0.00	0.54	1.00
Burkina Faso	1		-0.29	13.82	0.00	5.54	581.57	15.73	0.40	-0.43	-0.27
Burundi	0		-1.18	23.49	0.00	0.51	228.14	8.94	0.00	-1.17	-1.03
Cambodia	0		-1.17	2.43	0.00	0.00	813.77	14.37	0.00	-1.11	-0.48
Cameroon	1		-1.11	8.15	4.92	0.12	1348.09	20.09	0.00	-1.08	-0.84
Central African	1		-1.15	11.15	0.00	0.06	394.12	4.37	0.00	-1.54	-1.27
Chad	1		-1.39	23.89	18.56	0.01	837.31	12.28	0.00	-1.41	-1.07
Chile	0		1.39	15.11	0.03	14.50	13050.30	16.97	3.67	1.30	1.44
China	0		-0.45	4.44	1.30	1.18	4626.14	1337.57	4.40	-0.47	-0.23
Colombia	1		-0.28	6.37	4.47	0.78	6374.60	45.80	26.00	-0.42	0.25
Congo, Dem. Rep.	1		-1.37	31.07	1.83	10.49	347.22	65.43	0.00	-1.61	-1.43
Congo, Rep.	1		-1.14	44.33	39.79	0.03	2637.71	4.35	0.00	-1.19	-1.22
Cote d'Ivoire	1		-0.90	6.37	2.45	0.85	1295.60	20.64	1.00	-1.12	-0.76
Dominican Republic	1		-0.76	1.53	0.00	1.49	5458.36	9.89	7.00	-0.61	-0.18
Ecuador	0		-0.70	12.36	11.89	0.13	4775.57	14.94	7.00	-0.99	-1.01
Egypt, Arab Rep.	0		-0.64	9.97	7.91	0.27	2449.39	84.84	0.00	-0.31	-0.52
Equatorial Guinea	0		-1.63	37.19	32.99	0.02	15995.70	1.02	0.00	-1.38	-1.37
Eritrea	0		-0.40	5.07	0.00	1.94	521.39	4.13	0.00	-1.15	-1.99
Eswatini	0		-0.34	2.94	0.00	0.53	3733.80	1.22	0.00	-0.55	-0.55
Ethiopia	1		-0.61	18.32	0.00	0.46	352.93	88.14	3.67	-0.68	-1.02
Gabon	0		-0.83	29.96	26.80	0.09	9267.09	1.65	0.00	-0.56	-0.55
Gambia, The	0		-0.63	5.58	0.00	0.00	531.59	1.66	0.00	-0.44	-0.40
Germany	1		1.81	0.14	0.02	0.00	42874.67	81.75	6.50	1.70	1.61
Ghana	1		-0.13	13.25	1.82	4.34	1372.03	24.55	0.00	0.02	-0.05

Country Name	M_EITI	CCI	NRR	OIL	MIN	GDPpc	POP2 (mil)	FOI	RL	RO
Guatemala	1	-0.67	2.08	0.53	0.53	2860.75	14.66	3.67	-1.04	-0.22
Guinea	1	-1.06	18.86	0.00	8.82	665.75	10.90	2.38	-1.36	-1.04
Guinea-Bissau	0	-1.28	16.18	0.00	0.00	545.05	1.57	0.00	-1.34	-1.13
Guyana	0	-0.56	19.57	0.00	10.45	3099.28	0.76	1.00	-0.52	-0.52
Honduras	1	-0.83	2.03	0.00	0.66	1959.20	8.18	5.20	-0.96	-0.35
India	0	-0.40	3.67	0.97	1.03	1383.87	1227.83	6.07	0.02	-0.36
Indonesia	1	-0.65	7.42	2.81	1.69	3223.81	244.01	2.57	-0.57	-0.33
Iran, Islamic Re	0	-0.66	25.56	22.50	0.83	6157.43	74.79	3.00	-0.88	-1.43
Iraq	1	-1.35	48.63	48.37	0.00	4656.65	31.22	0.00	-1.60	-1.25
Kazakhstan	1	-0.95	22.89	16.20	3.77	9025.07	16.33	0.40	-0.72	-0.28
Kenya	0	-0.97	3.39	0.00	0.07	981.95	41.57	0.20	-0.77	-0.24
Kuwait	0	0.10	49.54	48.83	0.00	40721.48	3.17	0.00	0.37	0.11
Kyrgyz Republic	1	-1.18	7.03	0.40	6.39	881.28	5.48	3.93	-1.12	-0.42
Lao PDR	0	-1.11	12.06	0.00	7.95	1184.79	6.22	0.00	-0.96	-1.03
Lesotho	0	0.05	4.75	0.00	0.00	1151.58	2.06	0.00	-0.19	-0.53
Liberia	1	-0.78	25.12	0.00	4.85	507.28	3.91	2.40	-1.04	-1.20
Libya	0	-1.04	58.13	57.04	0.00	11027.34	5.91	0.00	-0.94	-1.27
Macedonia, FYR	0	-0.25	2.98	0.00	2.33	4454.81	2.07	5.20	-0.29	0.22
Madagascar	1	-0.50	8.27	0.03	0.79	416.44	21.25	0.00	-0.64	-0.48
Malawi	1	-0.61	8.05	0.00	0.00	434.83	15.22	0.21	-0.20	-0.61
Malaysia	0	0.18	10.42	5.10	0.15	9289.49	28.16	0.00	0.47	0.59
Mali	1	-0.64	10.86	0.00	7.75	694.48	15.13	0.00	-0.45	-0.49
Mauritania	1	-0.68	33.35	3.46	27.55	1215.77	3.65	0.00	-0.81	-0.58
Mexico	0	-0.45	5.02	4.10	0.60	9310.46	117.25	9.00	-0.49	0.34
Mongolia	1	-0.55	28.81	1.49	18.47	2875.21	2.72	1.57	-0.26	-0.31
Morocco	0	-0.29	2.24	0.01	2.01	2805.30	32.59	0.00	-0.18	-0.18
Mozambique	1	-0.60	12.80	0.22	0.04	421.54	24.40	0.67	-0.70	-0.51
Myanmar	1	-1.30	9.11	1.15	0.43	972.98	50.35	0.00	-1.41	-1.82
Namibia	0	0.31	2.82	0.00	2.22	5221.52	2.21	0.00	0.18	0.05
Nicaragua	0	-0.73	2.81	0.00	1.23	1624.83	5.73	4.40	-0.72	-0.40
Niger	1	-0.70	11.98	1.32	0.59	355.27	16.67	1.87	-0.60	-0.57
Nigeria	1	-1.14	13.98	11.65	0.03	2198.91	159.68	1.87	-1.13	-0.86
Norway	1	2.10	9.28	6.95	0.03	88831.16	4.86	4.54	1.95	1.49
Oman	0	0.35	39.12	36.15	0.05	17959.91	3.19	0.00	0.47	0.56
Pakistan	0	-0.93	2.02	0.75	0.05	1053.28	171.34	9.00	-0.83	-0.64
Papua New Guinea	1	-1.04	30.73	6.91	19.37	1867.71	6.79	0.00	-0.93	-0.66
Peru	1	-0.32	8.52	0.88	7.25	4962.82	29.46	8.00	-0.58	0.36
Philippines	1	-0.61	2.31	0.16	1.62	2193.53	93.90	0.20	-0.45	-0.11

Country Name	M_EITI	CCI	NRR	OIL	MIN	GDPpc	POP2 (mil)	FOI	RL	RO
Qatar	0	0.92	32.20	26.91	0.00	66764.75	1.67	0.00	0.70	0.50
Russian Federation	0	-0.96	15.41	9.71	1.14	10510.44	143.53	3.00	-0.84	-0.33
Rwanda	0	0.20	6.96	0.00	0.17	568.50	10.30	1.00	-0.37	-0.28
Sao Tome and Principe	1	-0.20	3.45	0.00	0.00	1113.16	0.18	0.00	-0.60	-0.76
Saudi Arabia	0	-0.01	41.21	40.18	0.05	20241.78	28.35	0.00	0.11	0.06
Senegal	1	-0.24	3.35	0.00	1.06	1267.56	13.06	0.00	-0.20	-0.22
Seychelles	1	0.44	0.13	0.00	0.00	11367.67	0.09	0.00	0.09	-0.40
Sierra Leone	1	-0.89	17.73	0.00	7.64	419.95	6.44	1.00	-0.94	-0.91
Solomon Islands	1	-0.27	21.07	0.00	2.01	1372.00	0.54	0.00	-0.56	-1.05
South Africa	0	0.17	6.48	0.07	2.72	7172.21	51.90	11.00	0.12	0.46
Sudan	0	-1.35	12.05	10.17	1.28	1555.64	34.66	0.40	-1.34	-1.39
Suriname	0	-0.20	27.58	6.38	20.24	8307.91	0.54	0.00	-0.11	-0.54
Tajikistan	1	-1.19	1.80	0.08	1.54	758.81	7.69	1.00	-1.18	-1.06
Tanzania	1	-0.56	6.91	0.00	2.48	724.59	46.51	0.20	-0.41	-0.43
Thailand	0	-0.34	2.57	1.21	0.05	5056.22	67.08	14.00	-0.08	0.24
Timor-Leste	1	-0.62	46.10	32.79	0.00	3245.17	1.15	0.00	-1.10	-1.09
Togo	1	-0.94	16.70	0.00	9.89	540.29	6.46	0.14	-0.91	-0.85
Trinidad and Tobago	1	-0.11	15.06	8.27	0.00	15665.06	1.32	10.36	-0.08	0.53
Tunisia	0	-0.12	5.00	3.69	0.71	3948.02	10.68	1.87	-0.01	-0.16
Turkmenistan	0	-1.45	40.34	13.55	0.00	4730.24	5.14	0.00	-1.49	-2.02
Uganda	0	-0.92	14.06	0.00	0.05	581.08	34.23	6.07	-0.39	-0.20
Ukraine	1	-0.92	6.41	0.55	3.08	2961.78	46.06	1.87	-0.77	-0.52
United Arab Emir	0	1.05	22.37	21.35	0.00	44441.01	7.33	0.00	0.52	0.71
United Kingdom	1	1.78	0.81	0.59	0.00	40230.79	62.77	11.00	1.72	1.74
United States	1	1.43	0.91	0.28	0.09	49684.06	308.47	45.00	1.60	1.47
Uzbekistan	0	-1.19	22.79	2.85	6.33	1411.44	28.68	14.00	-1.27	-1.54
Venezuela, RB	0	-1.16	21.73	20.49	0.70	13213.12	28.32	0.00	-1.56	-1.39
Vietnam	0	-0.58	7.99	5.16	0.40	1326.85	88.80	0.20	-0.42	-0.57
Yemen, Rep.	1	-0.95	30.62	30.30	0.00	1236.91	21.98	0.00	-1.06	-0.71
Zambia	1	-0.45	16.90	0.00	13.33	1390.50	14.02	0.00	-0.40	-0.51
Zimbabwe	0	-1.35	7.41	0.00	3.51	1038.39	15.26	12.50	-1.54	-1.82

mean and median indicates skewness in the distribution of the *CCI* variable in the dataset.

Concerning *M\_EITI*, 48% of the sampled countries are EITI implementers. The 15 years maximum value for *T\_EITI* indicates the period for which the EITI has been in operation as per our estimated sampling period (2003-2017). The mean duration (i.e. experience) for which the sampled countries have been implementing EITI standards is approximately 3 years 10 months, as can be observed from the mean value (3.84) of *MT\_EITI*. Also, the *MT\_EITI* standard deviation of 4.96 indicates the wide variation that exists in terms of EITI implementation experience within the dataset. The most experienced EITI-implementing countries in our sample have been EITI implementers for approximately 15 years (i.e. from the initial year of 2003).

Regarding natural resource rents, the mean value of *NRR*, 13.18, indicates that, on average, total natural resource rent as a percentage of GDP is above 13%. The EITI-implementing country with the highest level of dependence on natural resource rents is Timor-Leste. The mean (median) value for oil rents (*OIL*) as a percentage of GDP is 6.05 (0.54), while the mean (median) for mineral rents (*MIN*) as a percentage of GDP is 2.11 (0.30). Collectively, in the sample, there is greater dependence on oil rents than on mineral rents.

**Table 4 Descriptive Statistics**

Variable	N	Mean	Median	Std Dev	P99	Min	Max
<i>CCI</i>	1493	-0.48	-0.60	0.68	1.22	-1.40	1.22
<i>M_EITI</i>	1493	0.48	0.00	0.50	1.00	0.00	1.00
<i>T_EITI</i>	1493	7.98	8.00	4.28	15.00	1.00	15.00
<i>MT_EITI</i>	1493	3.84	0.00	4.96	15.00	0.00	15.00
<i>NRR</i>	1493	13.18	8.87	12.16	43.47	0.84	43.47
<i>OIL</i>	1493	6.05	0.54	10.72	37.89	0.00	37.89
<i>MIN</i>	1493	2.11	0.30	3.81	14.12	0.00	14.12
<i>lnGDP</i>	1493	7.89	7.81	1.32	10.61	5.99	10.61
<i>FOI</i>	1493	2.68	0.00	4.56	15.00	0.00	15.00
<i>HEXgdp</i>	1493	5.51	5.27	2.11	10.08	2.36	10.08
<i>Mergdp</i>	1493	62.26	55.60	27.48	120.07	24.44	120.07
<i>lnPOP</i>	1493	16.30	16.43	1.59	19.04	13.20	19.04
<i>RQ</i>	1493	-0.41	-0.45	0.68	1.11	-1.52	1.11
<i>RL</i>	1493	-0.53	-0.58	0.64	0.86	-1.53	0.86
<i>FDIgdp</i>	1493	4.04	3.06	3.34	12.52	0.00	12.52
<i>DISC</i>	1493	4.46	5.00	2.79	9.00	0.00	9.00

All variables are defined in Table 2.

For GDP, the mean (median) value for the sampled countries is 7.89 (7.81). The difference between the maximum (10.61) and minimum (5.99) indicates the presence of wealthy countries and very poor countries in the dataset. For FOI law, the mean period for which countries in the sample have adopted FOI law is 2.68 years. The mean (median) values for *HEXgdp* and *MERGdp* are 5.51 (5.27) and 62.26 (55.60), respectively, which suggests

Table 5 Correlation Matrix (All Sampled Countries)

	<i>CCI</i>	<i>M_EITI</i>	<i>T_EITI</i>	<i>MT_EITI</i>	<i>NRR</i>	<i>OIL</i>	<i>MIN</i>	<i>lnGDP</i>	<i>FOI</i>	<i>HEXgdp</i>	<i>Mergdp</i>	<i>lnPOP</i>	<i>RQ</i>	<i>RL</i>	<i>FDIgdp</i>	<i>DISC</i>
<i>CCI</i>	1.00															
<i>M_EITI</i>	-0.14***	1.00														
<i>T_EITI</i>	0.00	-0.01	1.00													
<i>MT_EITI</i>	-0.10***	0.80***	0.41***	1.00												
<i>NRR</i>	-0.19***	-0.01	-0.07**	-0.01	1.00											
<i>OIL</i>	-0.05**	-0.15***	-0.11***	-0.14***	0.78***	1.00										
<i>MIN</i>	-0.06**	0.17***	0.12***	0.20***	0.23***	-0.22***	1.00									
<i>lnGDP</i>	0.60***	-0.27***	0.08***	-0.19***	0.14***	0.44***	-0.14***	1.00								
<i>FOI</i>	0.13***	-0.01	0.31***	0.11***	-0.28***	-0.18***	-0.04*	0.26***	1.00							
<i>HEXgdp</i>	0.15**	0.03	0.09***	0.05**	-0.38***	-0.40***	-0.07**	-0.08***	0.26***	1.00						
<i>Mergdp</i>	0.19***	-0.17***	-0.04**	-0.16***	0.15***	0.18***	0.08***	0.25***	-0.16***	-0.18***	1.00					
<i>lnPOP</i>	-0.14***	0.08***	0.05**	0.09***	-0.20***	-0.11***	-0.07**	-0.05**	0.24***	0.08***	-0.44***	1.00				
<i>RQ</i>	0.79***	-0.08***	0.01	-0.05**	-0.25***	-0.07***	-0.03	0.62***	0.28***	0.11***	0.19***	0.03	1.00			
<i>RL</i>	0.91***	-0.19***	0.03	-0.14***	-0.19***	-0.04	-0.04	0.60***	0.15***	0.09***	0.22***	-0.08***	0.86***	1.00		
<i>FDIgdp</i>	-0.05**	0.18***	-0.02	0.16***	0.11***	-0.04	0.22***	-0.08***	-0.06**	0.01	0.34***	-0.28***	0.00	-0.02	1.00	
<i>DISC</i>	0.17***	0.02	0.48***	0.22***	-0.02	0.00	0.11***	0.20***	0.31***	-0.04**	-0.02	0.19***	0.29***	0.22***	0.01	1.00

\*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5% and 10% levels, respectively. All variables are defined in Table 2.

that, as a percentage, average health expenditure and merchandise trade account for approximately 6% and 62% of GDP, respectively, for the sampled countries. The natural logarithm of the population for the sampled countries is 16.30, and when comparatively assessing the mean of the population with the standard deviation, we see that most of the sampled countries have a sizeable population. The mean (median) values for  $RQ$  and  $RL$  are -0.41 (-0.45) and -0.53 (-0.58), respectively, showing that the sample countries on average have poor rule of law and regulatory qualities. Finally, the means of  $FDI_{gdp}$  and  $DISC$  are 4.04 and 4.46, respectively, across the sampled countries.

Table 5 reports the correlation matrix for all variables. There is a negative relationship between  $CCI$  and  $M\_EITI$  ( $r = -0.14$ , significant at the 1% level) and between  $CCI$  and  $MT\_EITI$  ( $r = -0.10$ ). Essentially, this primary association test shows that a longer period of implementing the EITI could be associated with decreasing control of corruption; nonetheless, a conclusion on the association should be based on regression analysis which tests for the impact of  $MT\_EITI$  and  $CCI$  in a multivariate context. We note a negative association between  $CCI$  and  $NRR$  ( $r = -0.19$ ),  $CCI$  and  $OIL$  (-0.05), and  $CCI$  and  $MIN$  (0.06), all significant at conventional levels, which appear to be in line with the expected signs. Likewise, other control variables appear to follow expected signs and are significant at conventional levels. In any case, the conclusion on the association here would be reached on the basis of the multivariate regression tests.

## 5.2 Main Results

In Table 6, we report the OLS pooled regression results for our estimation model. We report the association between  $CCI$  and  $MT\_EITI$  controlling for identified country-level characteristics linked to membership of the international policy reform programme. In the main model, the coefficient on  $MT\_EITI$  is 0.011 and significant at the 1% level. This result provides support for our supposition that membership of the EITI over time leads to better control of corruption in resource-rich countries. The sign and significance of the control variables are in most respects consistent with our expectations. For example, the positive coefficients on  $\ln GDP$ ,  $HEX_{gdp}$ ,  $RL$ , and  $DISC$ , significant at the conventional levels, confirm that the wealthier a country is (i.e. GDP), with high health expenditure to GDP ( $HEX_{gdp}$ ), a strong rule of law ( $RL$ ) and good country-level disclosure practices ( $DISC$ ), the better its ability to control corruption. However, given that our full sample contains the four OECD countries with relatively very high control of corruption scores, the coefficients noted in  $MT\_EITI$  may be overstated across the models, and thus there is a need for further empirical investigation.

To execute our estimation model appropriately, we begin by conducting a non-parametric test to accurately identify the differentials in the two groups within our sample (i.e. EITI implementers and non-EITI implementers). In Fig. 1, we report the  $CCI$  kernel density estimation (KDE) graph for the groups. The computed KDE provides a graphical comparison

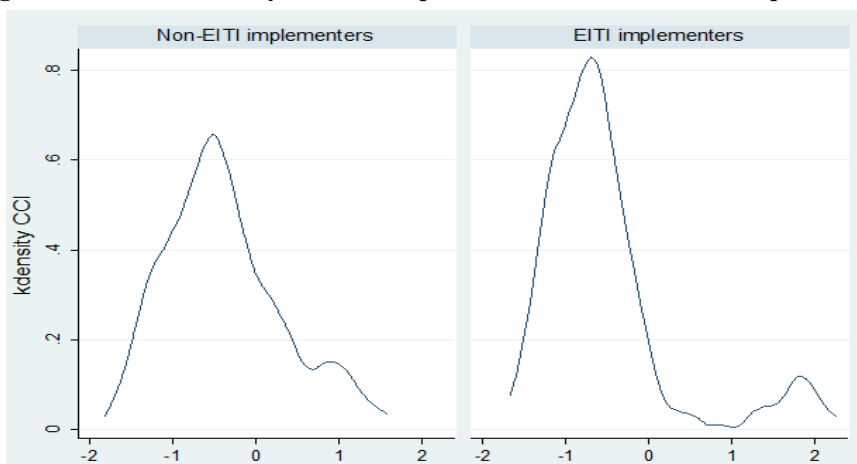
of EITI and non-EITI implementers' control of corruption scores over the sample period. While the two groups' CCI scores based on the two KDE diagrams show a difference within the groups, there still appears to be a relatively similar pattern from a pictorial review, and thus empirical confirmation through a two-sample t-test is needed to provide further confirmation.

**Table 6 Pooled OLS Regressions for EITI Implementation Experience on the Control of Corruption**

Variable	Coef.	RSE	p-value
<i>M_EITI</i>	0.011	0.028	0.686
<i>T_EITI</i>	-0.011	0.004	0.002***
<i>MT_EITI</i>	<b>0.011</b>	<b>0.003</b>	<b>0.001***</b>
<i>NRR</i>	-0.003	0.001	0.000***
<i>lnGDP</i>	0.074	0.009	0.000***
<i>FOI</i>	-0.005	0.002	0.007***
<i>HEXgdp</i>	0.026	0.003	0.000***
<i>MERgdp</i>	-0.001	0.000	0.0738
<i>lnPOP</i>	-0.045	0.005	0.000***
<i>RQ</i>	-0.060	0.028	0.033**
<i>RL</i>	0.939	0.029	0.000***
<i>FDIgdp</i>	-0.011	0.002	0.000***
<i>DISC</i>	0.006	0.003	0.102
Constant	0.147	0.135	0.278
Year FE	Yes		
Continent FE	Yes		
R-Squared	0.87		
Observations	1,493		

\*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5% and 10% levels, respectively. Table 6 reports the pooled regression results of testing the base model under different measures of natural resource dependency. All models are estimated on the basis of robust standard errors (RSE), and all continuous variables are winsorised at the 1<sup>st</sup> and 99<sup>th</sup> percentiles. All variables are defined in Table 2.

**Figure 1 Kernel Density of EITI Implementers and Non-EITI Implementers**





The t-test results are reported in tables 7A and 7B. The output in the tables reports the summary statistics for EITI membership (i.e. non-EITI implementers [0] and EITI implementers [1]) under the full sample and the reduced sample excluding OECD countries. The t-test for difference in the groups provides evidence that the means of the two groups are not equal. Specifically, the EITI implementers' average score for CCI is different from that of the non-EITI implementers and statistically significant at the 1% level under the full and reduced sample specifications. Given this difference, a benchmark sample based on comparable parameters would be ideal as a control sample to match the treatment sample and thus enable the assessment of the counterfactual scenario of whether the EITI implementation process leads to improved control of corruption for countries implementing EITI standards.

**Table 7A Independent Sample Test (All Sample)**

<b>Group</b>	<b>N</b>	<b>Mean</b>	<b>Std. Err.</b>	<b>Std. Dev.</b>
Non-EITI Implementers [0]	772	-0.388	0.025	0.682
EITI Implementers [1]	721	-0.585	0.025	0.663
Combined	1,493	-0.483	0.018	0.680
<b>Difference</b>		<b>0.197</b>	<b>0.035</b>	
T-statistic	5.646			
<b>Pr( T  &gt;  t )</b>	<b>0.000***</b>			

**Table 7B Independent Sample Test (Excluding OECD Countries)**

<b>Group</b>	<b>N</b>	<b>Mean</b>	<b>Std. Err.</b>	<b>Std. Dev.</b>
Non-EITI Implementers [0]	772	-0.388	0.025	0.682
EITI Implementers [1]	664	-0.739	0.016	0.417
Combined	1,436	-0.550	0.016	0.601
<b>Difference</b>		<b>0.351</b>	<b>0.030</b>	
T-statistic	11.545			
<b>Pr( T  &gt;  t )</b>	<b>0.000***</b>			

The output of tables 7A and 7B report the summary statistics for EITI membership (i.e. non-EITI implementers [0] and EITI implementers [1]) under the full sample and the reduced sample excluding OECD countries. The t-test for the difference in the groups provides evidence that the means of the two groups are not equal.

Consequently, our next steps involve the estimation of the propensity score benchmark sample to match our sample on the basis of observable attributes. Using the PSM technique to test our hypotheses entails selecting characteristics (variables) that would enable us to develop the matching index to be used for our estimation model. Following Chintrakarn (2008) and Liu and Florax (2014), we use *GDP*, *FOI*, *HEXgdp*, *MERGdp*, *POP*, *RQ*, *RL*, *FDIgdp*, and *DISC*, including year and continent fixed effects, as our full variables for the probit model to estimate the likelihood of being an EITI implementer and thus determine the matched sample. Subsequently, we use these estimates to calculate the propensity score. Our matching parameter allows us to next match each treatment observation with the closest benchmark

(control) observation propensity score with replacement. Table 8 reports the results of the probit regression estimation. Consistent with prior literature (Papyrakis *et al.*, 2017; Pitlik *et al.*, 2010; Vadlamannati and Cooray, 2017; Williams, 2011), the results show that countries with high natural resource dependence (*NRR*), low economic development and wealth (*GDP*), fewer years of FOI act adoption (*FOI*), a low health spending to GDP ratio (*HEXgdp*), and a low merchandise to *GDP* ratio have a high propensity to join the EITI.

**Table 8 Probit Regression Estimation of the Likelihood of Joining the EITI (Excluding OECD Countries)**

Variable	Coef.	Std. Err.	P>z
<i>NRR</i>	0.010	0.004	0.015**
<i>lnGDP</i>	-0.530	0.054	0.000***
<i>FOI</i>	-0.027	0.011	0.015**
<i>HEXgdp</i>	-0.148	0.023	0.000***
<i>MERgdp</i>	-0.006	0.002	0.000***
<i>lnPOP</i>	0.020	0.030	0.491
<i>RQ</i>	0.812	0.142	0.000***
<i>RL</i>	-0.997	0.143	0.000***
<i>FDIgdP</i>	0.112	0.014	0.000***
<i>DISC</i>	0.046	0.021	0.028**
Constant	4.026	0.707	0.000
Year FE	Yes		
Continent FE	Yes		
Observations	1414		
Pseudo R2	26%		

\*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Dependent variable: *M\_EITI* (i.e. EITI implementers). All continuous variables are winsorised at the 1<sup>st</sup> and 99<sup>th</sup> percentiles. All variables are defined in Table 2.

In Table 9, we report the PSM dataset results for our empirical analysis. The predicted results from the test model support our hypothesis. In particular, and based on our PSM dataset which allows us to observe the counterfactual impact of EITI implementation on the control of corruption, the coefficient (p-value) on *MT\_EITI*, 0.008 (0.014), in our main test model using *NRR* as the main natural resource dependency measure shows that countries that have been implementing EITI standards over time do improve their control of corruption, *ceteris paribus*. Insightfully, our results show that EITI membership as a single explanatory measure is insufficient in terms of corruption control, a finding which is not uncommon in the EITI literature (Ölcer, 2009; Corrigan, 2014; Kasekende *et al.*, 2016). Specifically, the p-value on *M\_EITI* is not significant in our main model. One possible explanation for this is connected to the signalling value of joining the EITI. The most corrupt poor but resource-rich countries would likely be among the first to join the initiative. This could be to signal their intent to reduce corruption and thus encourage direct investment and facilitate borrowing from

international agencies such as the World Bank and IMF. However, only when their EITI implementation experience increases can countries extract benefits that could lead to improved control of corruption.

Relatedly, we note that the relationship that exists between  $T\_EITI$  and control of corruption is negative and significant at the 1% level, signifying that, collectively, corruption seems to be on the rise. Unsurprisingly, while several countries have signed up to different anti-corruption initiatives and there has been a rise in anti-corruption activism, there has also been a rise in the level of perceived corruption across the globe. In particular, Transparency International's 2019 CPI reveals that several countries have made little or no effort to tackle corruption (Transparency International, 2020). Specifically, the report highlights that “*similar to previous years, the data shows that despite some progress, a majority of countries are still failing to tackle public sector corruption effectively*” (Transparency International, 2020, p. 7). The clear insight from our analysis indicates that although there has been a general rise in issues of corruption for all the sampled countries over time, the situation diminishes for EITI implementers as the length of their implementation experience increases. Thus, consistent with our second hypothesis, the *length of EITI implementation experience is associated with improved control of corruption in EITI-implementing countries compared with their matched non-EITI-implementing counterparts*.

Several factors are important in explaining our result with respect to  $H_2$ . First, the incremental experience that countries gain from implementing EITI standards over time as part of good governance practice arguably leads to better control of corruption. The second, and perhaps the much stronger, factor is the possibility that the EITI oversight mechanism dissuades countries from using the EITI as a façade or window-dressing mechanism. This suggests that the EITI's monitoring process ensures that anticipated outcomes are cautiously pursued by implementing countries to protect them against the loss of reputation associated with the EITI being considered as an ineffective or mere tick-box initiative. Taken broadly, we can further interpret our result as implying that a one-year increase in EITI implementation experience leads to a 0.008-unit (i.e.  $MT\_EITI$  coefficient in Table 9) improvement in control of corruption for implementing countries compared to their closely matched non-EITI-implementing counterparts. This suggests that joining the EITI provides an important avenue for poor but natural resource rich countries to improve their control of corruption over time.

The coefficient (p-value) of -0.003 (0.000) on  $NRR$  explains that one-unit increase in total natural resource rents decreases a country's ability to control corruption by 0.3 units in a year (Table 9). This offers further insight consistent with the literature on the impact of natural resource dependence on control of corruption, especially in poor but resource-rich countries (Corrigan, 2014; Jović *et al.*, 2016; Öge, 2016; Okada and Samreth, 2017; Papyrakis *et al.*, 2017). Thus, countries with a high level of dependence on natural resource revenue also tend to have problems controlling corruption.

**Table 9 PSM Regressions for EITI Implementation Experience on the Control of Corruption (Excluding OECD Countries)**

Variable	Coef.	RSE	p-value
<i>M_EITI</i>	-0.010	0.028	0.712
<i>T_EITI</i>	-0.011	0.003	0.001***
<i>MT_EITI</i>	<b>0.008</b>	<b>0.003</b>	<b>0.014**</b>
<i>NRR</i>	-0.003	0.001	0.000***
<i>lnGDP</i>	0.054	0.011	0.000***
<i>FOI</i>	-0.008	0.002	0.000***
<i>HEXgdp</i>	0.012	0.004	0.004***
<i>MERgdp</i>	0.000	0.000	0.883
<i>lnPOP</i>	-0.049	0.005	0.000***
<i>RQ</i>	-0.018	0.030	0.554
<i>RL</i>	0.813	0.028	0.000***
<i>FDI<sub>gdp</sub></i>	-0.008	0.002	0.000***
<i>DISC</i>	0.021	0.003	0.000***
Constant	0.322	0.123	0.009***
Year FE	Yes		
Continent FE	Yes		
Observations	1341		
R-squared	0.77		

\*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Table 9 reports the PSM results of testing  $H_2$  using the base model [1] under different measures of natural resource dependency. All models are estimated on the basis of robust standard errors (RSE), and all continuous variables are winsorised at the 1<sup>st</sup> and 99<sup>th</sup> percentiles. All variables are defined in Table 2.

The result also confirms the role of GDP in explaining a country's level of corruption. In line with the literature (e.g. Houqe and Monem, 2016; Kasekende *et al.*, 2016) the test shows that better control of corruption is associated with a higher increase in GDP. The *FOI* variable is negative and significant at the 1% level, which indicates that more years of FOI law adoption does not necessarily translate into improved control of corruption for the majority of EITI implementers. This is interesting and similar to prior findings. Vadlamannati and Cooray (2017) for instance, find FOI laws to be associated with an increase in the perception of government corruption. They note that while this may appear worrying, it is good news because the existence of FOI laws results in more observed corruption that is driven by greater reporting (Vadlamannati and Cooray, 2017). Furthermore, the literature argues that FOI can be problematic in certain instances due to the limitations on its use in some jurisdictions (Escaleras *et al.*, 2010; Hazelton, 2013), thus suggesting that for FOI laws to be effective in addressing corruption issues, they must be coupled with accountability and other good governance mechanisms. It is argued that while FOI has the potential to positively improve transparency, it may unintendedly lead to an increase in corruption as it could provide information as to who to target for bribes within government (Bac, 2001; Escaleras *et al.*, 2010). In terms of the other control variables, *HEXgdp* is positive and significant at the 1%

level, while *MERgdp*, though positive, is not significant at conventional levels. This may be indicative of the fact that trade export and import in the sampled countries have limited influence on the control of corruption given the presence of increasing natural resource rents. In line with the literature, countries with a large population struggle with their control of corruption. Similar to Chen *et al.* (2015), we find that the additional controls appear to hold well. For example, countries with a high rule of law (*RQ*) and increased country-level disclosure (*DISC*) have better control of corruption (La Porta *et al.*, 2000; Kolstad and Søreide, 2009; Magno and Gatmaytan, 2017). As expected, countries with a high proportion of foreign direct investment and net inflows as a percentage of GDP struggle to control corruption.

### 5.3 Robustness Tests

In this section, we report the robustness checks for our findings. Generally, dependence on natural resource rents potentially has varying impacts depending on the type of resources a country depends upon most (Jović *et al.*, 2016; Papyrakis *et al.*, 2017). Thus, we examine the implication of different measures of resource rent dependence level given the presence of EITI implementation experience across all our specifications, as reported in models I and II in tables 10A and 10B. In these models, we introduce oil rents (*OIL*) and mineral rents (*MIN*)

**Table 10A Pooled OLS Regressions for EITI Implementation Experience on the Control of Corruption**

Variable	Model I: <i>OIL</i>			Model II: <i>MIN</i>		
	Coef.	RSE	p-value	Coef.	RSE	p-value
<i>M_EITI</i>	0.009	0.028	0.757	0.018	0.028	0.525
<i>T_EITI</i>	-0.012	0.004	0.001***	-0.010	0.004	0.007***
<i>MT_EITI</i>	<b>0.011</b>	<b>0.003</b>	<b>0.001***</b>	<b>0.010</b>	<b>0.003</b>	<b>0.002***</b>
<i>OIL</i>	-0.005	0.001	0.000***			
<i>MIN</i>				-0.004	0.002	0.018**
<i>lnGDP</i>	0.091	0.011	0.000***	0.051	0.009	0.000***
<i>FOI</i>	-0.005	0.002	0.005***	-0.004	0.002	0.020**
<i>HEXgdp</i>	0.026	0.003	0.000***	0.027	0.003	0.000***
<i>MERgdp</i>	-0.001	0.000	0.088*	0.000	0.000	0.137
<i>lnPOP</i>	-0.044	0.005	0.000***	-0.042	0.005	0.000***
<i>RQ</i>	-0.061	0.028	0.031**	-0.046	0.028	0.104
<i>RL</i>	0.928	0.029	0.000***	0.959	0.030	0.000***
<i>FDIgdp</i>	-0.012	0.002	0.000***	-0.012	0.002	0.000***
<i>DISC</i>	0.005	0.003	0.133	0.005	0.003	0.110
Constant	-0.020	0.142	0.886	0.231	0.138	0.095*
Year FE	Yes			Yes		
Continent FE	Yes			Yes		
R-Squared	0.87			0.87		
Observations	1,493			1,493		

\*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Table 6 reports the pooled regression results of testing the base model under different measures of natural resource dependency. All models are estimated on the basis of robust standard errors (RSE), and all continuous variables are winsorised at the 1<sup>st</sup> and 99<sup>th</sup> percentiles. All variables are defined in Table 2.

**Table 10B PSM Regressions for EITI Implementation Experience on the Control of Corruption (Excluding OECD Countries)**

Variable	Model I: <i>OIL</i>			Model II: <i>MIN</i>		
	Coef.	RSE	p-value	Coef.	RSE	p-value
<i>M_EITI</i>	-0.009	0.027	0.747	-0.003	0.027	0.916
<i>T_EITI</i>	-0.011	0.003	0.001***	-0.010	0.003	0.004***
<i>MT_EITI</i>	<b>0.007</b>	<b>0.003</b>	<b>0.018***</b>	<b>0.007</b>	<b>0.003</b>	<b>0.033**</b>
<i>OIL</i>	-0.003	0.001	0.002***			
<i>MIN</i>				-0.001	0.002	0.538
<i>lnGDP</i>	0.061	0.012	0.000***	0.039	0.010	0.000***
<i>FOI</i>	-0.008	0.002	0.000***	-0.008	0.002	0.000***
<i>HEXgdp</i>	0.012	0.004	0.006***	0.012	0.004	0.004***
<i>MERgdp</i>	0.000	0.000	0.917	0.000	0.000	0.897
<i>lnPOP</i>	-0.048	0.005	0.000***	-0.047	0.005	0.000***
<i>RQ</i>	-0.008	0.030	0.788	-0.004	0.030	0.903
<i>RL</i>	0.808	0.029	0.000***	0.827	0.029	0.000***
<i>FDIgdp</i>	-0.009	0.002	0.000***	-0.009	0.002	0.000***
<i>DISC</i>	0.020	0.003	0.000***	0.020	0.004	0.000***
Constant	0.230	0.132	0.083*	0.368	0.124	0.003***
Year FE	Yes			Yes		
Continent FE	Yes			Yes		
Observations	1341			1341		
R-squared	0.77			0.77		

\*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Table 9 reports the PSM results of testing  $H_2$  using the base model [1] under different measures of natural resources dependency. All models are estimated on the basis of robust standard errors (RSE), and all continuous variables are winsorised at the 1<sup>st</sup> and 99<sup>th</sup> percentiles. All variables are defined in Table 2.

as alternative proxies for natural resource revenue dependence and find the effect of EITI implementation experience on the control of corruption remains positive and statistically significant at the conventional levels. This further confirms our earlier results. Overall, these additional results are qualitatively similar to our main findings.

#### 5.4 Endogeneity Test

We conduct supplementary analyses by executing a two-stage least squares estimation (2SLS) regression. This procedure has the advantage of providing more consistent coefficients and helps to address endogeneity concerns regarding omitted variables in our estimation models (Cheng *et al.*, 2014; Sun *et al.*, 2020). Following prior literature (e.g. Cheng *et al.*, 2014; Gupta and Krishnamurti, 2020; Sun *et al.*, 2020), we generate two instruments by calculating the average EITI membership (*M\_EITI*) as well as the interaction term for EITI membership and time (i.e. *MT\_EITI*) for each continent-year pair. These instruments are uncorrelated with the error term in our estimated equation but highly correlated with the CCI. The use of the industry and country mean of the independent variables as instrumental variables is typical in prior literature (Cheng *et al.*, 2014; Sun *et al.*, 2020). Given the nature of our study, we implement continent-year mean instrumental variables which enable us to

estimate our 2SLS regressions. The use of the above instruments is premised on the fact that EITI-implementing countries' CCI scores are influenced by a time-varying component that is associated with each country's membership within their continent. The intuition here is that implementing countries' CCI scores are systematically influenced by the CCI score of other countries within the same continent-year pair and by the CCI scores of other countries in the same continent over the period for which the EITI has existed. This is consistent with prior findings (Pitlik *et al.*, 2010; Kasekende *et al.*, 2016; Papyrakis *et al.*, 2017; Vadlamannati and Cooray, 2017) that have shown that membership of international initiatives such as the EITI is determined by both continent and country (idiosyncratic) level factors. As an illustration, it has been found that a country in a particular continent where other countries similar to it have enlisted in the EITI is more likely to join the initiative to avert the risk of losing out on benefits (i.e. FDI and donor-supported funding) that similar countries could gain by joining the initiative.

**Table 11 Two-Stage Least Squares Estimation**

	First stage: <i>MT_EITI</i>			Second stage [2SLS]: <i>CCI</i>		
	Coef.	RSE	p-value	Coef.	RSE	p-value
<i>Continent_Year (M_EITI)</i>	-8.222	3.914	0.036**			
<i>Continent_Year (MT_EITI)</i>	1.014	0.104	0.000***			
<b><i>MT_EITI</i></b>				<b>0.029</b>	<b>0.011</b>	<b>0.007***</b>
<i>M_EITI</i>	7.818	0.135	0.000***	-0.128	0.084	0.129
<i>T_EITI</i>	0.014	0.062	0.822	-0.020	0.006	0.001***
<i>NRR</i>	0.019	0.006	0.001***	-0.004	0.001	0.000***
<i>lnGDP</i>	-0.088	0.074	0.236	0.076	0.009	0.000***
<i>FOI</i>	-0.013	0.017	0.454	-0.005	0.002	0.011**
<i>HEXgdp</i>	-0.012	0.031	0.699	0.026	0.003	0.000***
<i>MERgdp</i>	-0.006	0.002	0.016**	0.000	0.000	0.122
<i>lnPOP</i>	0.026	0.041	0.531	-0.046	0.005	0.000***
<i>RQ</i>	0.572	0.194	0.003***	-0.070	0.028	0.013**
<i>RL</i>	-0.224	0.195	0.251	0.943	0.029	0.000***
<i>FDIgdp</i>	0.044	0.018	0.015**	-0.012	0.002	0.000***
<i>DISC</i>	-0.037	0.030	0.212	0.006	0.003	0.065*
Constant	0.604	2.371	0.799	0.206	0.141	0.143
Year FE	Yes			Yes		
Continent FE	Yes			Yes		
Observations	1,493			1,493		
R-squared (centred)	96.52			0.86		
<b>Under-identification test</b>						
Kleibergen-Paap rk LM statistic						65.84 (0.000***)
<b>Weak identification test</b>						
Kleibergen-Paap Wald rk F statistic						47.19
Cragg-Donald Wald F statistic						64.88
<b>Overidentification test of all instruments</b>						
Hansen J statistic						0.021 (0.8859)

\*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively. All variables are defined in Table 2.

In Table 11, we report the results of the 2SLS analysis, beginning with the first-stage estimation output. The first-stage regression is estimated using two variables (continent-year mean of EITI membership and continent-year mean of the interaction term between  $M\_EITI$  and  $T\_EITI$ ) as the instrumental variables for the endogenous regressor  $MT\_EITI$ . The post-estimation tests for the two stages of the instrumental variable regressions are reported underneath the results in Table 11.<sup>12</sup> We then move our focus to the output of the second-stage regression. The results of our 2SLS analysis show that the coefficient (0.029) and the p-value (0.007) of the interaction term of EITI membership and time ( $MT\_EITI$ ) are positive and statistically significant at the 1% level in the second-stage regression. This provides further support for our main result: compared to their non-EITI counterparts, countries implementing EITI standards over time have a better opportunity to improve their control of corruption.

## VI. Conclusion

We examine the effect of EITI implementation experience on the control of corruption. Using a pair-matched sample, we find that for the set of EITI-implementing countries, EITI membership on its own does not necessarily result in improved control of corruption. However, for countries implementing EITI standards, EITI implementation experience is associated with improved control of corruption. We interpret this as suggesting that the ability of the EITI implementation process to improve corruption in implementing countries rests on experience accumulated over time and oversight from the EITI. The evidence suggests that joining the EITI may be a signal of commitment to reducing corruption, but the level of corruption only reduces with increasing EITI implementation experience and oversight. The results are robust to the use of alternative measures of resource dependence and to the use of 2sls regressions to correct for endogeneity. The study demonstrates for the first time that natural resource rich developing countries that adopt EITI standards could improve natural resource accountability and by extension lower their level of corruption in the management of natural resource revenue.

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<sup>12</sup> The under-identification test based on the Kleibergen-Paap rk LM statistic tests whether our equation is identified or not. The result of the test provides evidence that our model is identified, and hence there is no evidence of under-identification. The second test for weak identification executed using the Kleibergen-Paap Wald rk and Cragg-Donald Wald F statistics estimates how strong the instrumental variables are. For our estimated sample, the critical value is at least 19.93, which our test results are much greater than, indicating that our instruments are relevant and strong (Stock and Yogo, 2005; Gupta and Krishnamurti, 2020). Finally, our reported overidentification test of all instruments is hypothesised in null form as our “instruments are exogenous or uncorrelated with the error term”. Hence, a statistically significant p-value at the conventional level would imply that our instruments are not exogenous, which is not the case given the Hansen statistic (p-value 0.859) result. Thus, the null hypothesis is accepted here, and our instruments are exogenous. Overall, the tests show that our instruments satisfy the conditions of exogeneity and relevance and are thus valid for estimation.



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