Essays on the Political Economy of Extractive-Led Development

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Chapter 1.

Introduction: Extractive-Led Development

This thesis aims to increase our understanding of the societal impacts of the extraction of coveted minerals (such as oil, gas, gold, copper, and other mined materials), as well as the role of the recent policy trend towards implementing transparency and accountability standards to help govern the extractive sector. This introductory chapter begins by providing context to the current heightened global interest in the extractive industries. Next, it briefly summarises some of the key economic arguments and research behind many countries' promotion of the extractive sector for development purposes. It then describes some of the common problems associated with extraction, as highlighted by the literature dedicated to a phenomenon commonly known as the 'resource curse'. This chapter's final section describes the outline and contributions of the four empirical studies featured in this thesis.

Keywords: Extractive Industries; International Development; Resource Curse

1.1 Introduction

At the time of writing this thesis, the extraction of coveted minerals (such as oil, gas, gold, copper, and other mined materials) continues to stimulate significant interest from both the world's international and scientific communities. A key reason behind this heightened interest is the common view that the wealth generated from the extraction of minerals could help support economic growth and development. Now, perhaps more than ever, these growth prospects are highly attractive to many countries due to the economic hardships inflicted by the ongoing Covid-19 global pandemic.

However, while common conceptions link the extraction of minerals to wealth and prosperity, in recent decades a more critical understanding of the potential effects of economies' extractive-led development has also been gaining currency. Epitomised by a socio-economic phenomenon coined the 'resource curse' (Auty, 1993), this phenomenon highlights that economies that are more dependent on the extraction of resources often grow more slowly than economies less dependent on such activities (Sachs and Warner, 2001; Ross, 1999). Alongside explanations indicating the potential problems created by the negative externalities of the commodity markets (such as de-industrialisation and economic volatility), mismanagement of mineral wealth is also regularly cited as one of the main contributors to the resource curse phenomenon (van der Ploeg, 2011).

This thesis aims to increase our understanding of the societal impacts of the extractive sector, as well as the role of the recent policy trend towards implementing transparency and accountability standards to help combat the mismanagement of this sector. This introductory chapter continues in Section 1.2, which provides greater context to current heightened global interest in the extractive industries. Next, Section

1.3 describes in further detail the key economic arguments underpinning extractive-led development strategies. Section 1.4 then summarises the research devoted to the resource curse. Finally, Section 1.5 describes the outline and contributions of this thesis to the relevant literature.

1.2 Why are extractives in the spotlight?

In recent years, global interest in the extractive sector has risen for at least two key reasons. The first reason arises, rather counter-intuitively, from increased climate action. Progress on the so-called *energy transition* (i.e. moving the global economy from high carbon-intensive to low carbon-intensive energy production to mitigate against the future effects of climate change) has created much greater knowledge and awareness of the global economy's likely long-term dependence on the extraction of mineral resources. For example, despite ambitious forecasts concerning the introduction of new sources of renewable energy (e.g. via solar and wind power), predictions show that oil, and gas in particular, are likely to remain an important component of the energy mix for many decades to come.[1] Subsequently, even countries that are supposed leaders and advocates for increasing the global pace of the energy transition have continued to consider measures to expand current oil and gas production.[2]

[1] Forecasts with a relatively progressive introduction of renewable energy indicate demand for oil and gas may continue to grow until 2035. Even in the years after peak demand, many forecasts show relatively modest declines in the absolute magnitude of demand for oil and gas relative to current levels until at least 2050 (Johnston et al., 2020). Further adding to the potential future demand for these resources is the very real possibility of the growth in global energy demand outpacing the relative deployment of renewable sources of energy and that there are many products where there remains no substitute using electricity only (such as planes in the aviation industry).

[2] A notable example includes the proposed opening of the Cambo oil field situated to the west of the Shetlands Islands, Scotland. Environmental campaigners have pointed to the hypocrisy of the U.K.'s intentions to open new fields while also preparing to host the global climate summit COP26 in Glasgow (Bradshaw, 2021). Alternatively, a report by the UN's Environmental Programme (UNEP, 2021) also further describes that G20 countries have directed more than USD300 billion towards funding new

Further to this, research about the energy transition has also made it clear that the technology required to produce renewable energy will demand large quantities of rare mineral resources. A recent study published by the World Bank finds that the production of minerals, such as graphite, lithium and cobalt, may increase by nearly 500% by 2050 to meet the growing demand for renewable energy technologies (see Hund et al. 2020).[3] In other words, even in a clean-energy future, mineral extraction will remain critical and may become even more important as scarce materials increasingly support the technologies required to satisfy future demand for goods and energy. Increasing demand for such minerals presents significant economic opportunities, which is naturally creating a great deal of commercial and geopolitical interest. For example, Tilley and Manely (2017) describe how the expansion of the production of these minerals could be transformative for the fortunes of many countries where these resources are located, such as the Democratic Republic of Congo, South Africa, India, Chile, Brazil, and Bolivia.

The second reason the extractive sector continues to receive heightened global interest at this time corresponds to the sector's purported role in supporting many countries' recovery from the devastating effects of the COVID-19 global health pandemic. Following severe civil restrictions and even complete lockdowns of society creating barriers to business in many countries, governments around the world are now looking for ways to support economic recovery. For many countries, rising global commodity demand offers a clear prospect for helping communities recover as extractive operations provide jobs and tax revenues to cash-strapped governments. In

fossil fuel activities since the beginning of the COVID-19 pandemic in 2019 – more than they have towards new sources of renewable energy. Many critics consider such investment into new fossil fuels could continue to create a degree of inertia, further delaying the pace of the energy transition and extending the global economy's reliance on fossil fuels (Fattouh et al., 2018).

[3] The report estimates that over 3 billion tons of minerals will be required to meet international climate change targets for achieving a below 2°C future.

particular, heightened gold prices are helping Tanzania to increase its mining revenues to a historical high, and economies such as Chile and Peru are also looking to take advantage of the significant increase in global demand for copper. South Africa's economic recovery plan has even identified revitalising the mining industry as a top priority, making plans to simplify mining regulations and fast-track approvals so that mining and environmental permits can be granted faster (Fernandez-Stark et al., 2020; Rouget, 2020).

From these recent developments surrounding the extractive sector, it is clear that the sector will remain economically relevant in many countries and play an important role supporting global consumption patterns for the foreseeable future. Rhetoric concerning the economic potential of countries' mineral resources is continuing to grow in the wake of the COVID-19 pandemic and these arguments are likely to proliferate as the energy transition advances further and the demand for rare minerals increases. Overall, this points to the importance of continuing to improve our understanding of the impact of the extractive sector impact on society and the strategies that can help ensure that mineral endowments are managed appropriately.

1.3 The economic premise of extractive-led development

The reasons explaining countries' attraction to mineral extraction have been widely discussed and, as insinuated by the discussion above, are largely economic. At the core of these explanations is the understanding that rents (or revenues) from the extractive sector may offer a source of investible funds. It is argued that this capital can help societies increase their consumption and relax constraints to economic growth and development. This includes providing countries with opportunities to

expand their existing business prospects, attract foreign investment, and create new jobs (Karl, 2004).

This view is supported by the arguments of numerous prominent academic scholars and well-known growth models. For example, economists such as Jacob Viner (1953), Arthur Lewis (1955), and Walter Rostow (1961), have all historically asserted that resource extraction could help to finance the growth of domestic markets. Rostow's (1961) widely taught five-stage model of economic growth, for instance, infers that resource endowments can provide economies with the capital needed to industrialise and 'take-off' from traditional to modernised high-consumption societies. A related argument, based on the Harrod–Domar model, also suggests that the financial windfalls from extraction could be used to fill financing gaps and start a self-sustaining process of capital accumulation and economic growth (Easterly, 1999). Meanwhile, other arguments have also indicated that these rents may help to finance the development of economies' infant industries (Balassa, 1980). This view considers that, at the early stages of development, domestic industries often do not have the economies of scale to compete against more advanced competitors from abroad. Resource revenues may provide the necessary funds to help industries mature by making them more technologically advanced and competitive at an international scale.

Many arguments refer to the role these revenues could also play in helping to relieve societal issues such as the incidence of poverty and deprivation. In this respect, policy research continues to explore the possibilities of expanding security payments or cash transfers financed by resource revenues (Moss et al., 2015). For example, Segal (2012) shows that Mexico nearly eliminate extreme poverty by introducing a universal citizen dividend financed by public resource revenues. Other leading examples of such policies include cash transfer schemes operating in the State of Alaska, United States

(Goldsmith, 2010) and, within Latin America, Bolivia's universal pension scheme, Renta Dignidad (which is partly financed by direct hydrocarbon taxes; Segal, 2012). Alternatively, related policy options consider the possibilities of using resource revenues to finance improvements in local infrastructure (such as transport links, the electrical grid, or housing stock), as well as support public investment in areas such as health and education.

The premise for this extractive-led development imperative is also supported by a significant amount of empirical evidence and experience. Numerous examples exist of countries experiencing significant periods of economic growth following a mineral boom. These examples also include a legacy that can be traced back throughout much of humanity's contemporary history. Some early examples point to the importance of appropriated minerals from the Americas, such as gold and silver, in supporting the early development of European colonial superpowers (Hamilton, 1934).

However, more recent examples follow the transformation witnessed by Norway after the discovery of North Sea oil in the 1960 and '70s. Holden (2013) further describes Norway's progress from an economy with a modest GDP per capita, 5% below the OECD average in 1970, to one more than 70% above the OECD average by 2010. Larsen (2005; 2006) also provides a comparative analysis highlighting how Norway had even outgrown several of its historically more advanced neighbours, such as Denmark and Sweden, by the 1980s. This growth was reportedly supported by its heavy investment into high-tech industries and, to prevent overheating the domestic economy, investment of the remaining oil revenues into foreign securities through a newly established sovereign wealth fund. A complementary policy, known as the 'Spending Rule', also ensured that public spending did not greatly exceed the financial

returns of the fund's assets, thereby safeguarding the country's equitable, long-term principles on the distribution of resource rents across generations.

Botswana is also often highlighted as another modern 'success story' by proponents of extractive-led development imperative. After discovering its large endowment of diamonds in the early 1970s, Botswana enjoyed one of the world's strongest per-capita growth records in the decades that followed (Acemoglu et al., 2003; Poteete, 2009). Poteete (2009) describes the broad and stable political coalition during the first decades of Botswana's independence in 1966 that helped to encourage the adoption of pro-growth policies and strong institutional governance during this time.

1.4 The 'resource curse' paradox

Despite so-called 'success stories' from countries such as Norway and Botswana, the 'resource curse' phenomenon indicates economies that are more dependent on extraction often develop at a much slower rate (Auty, 1993; Sachs and Warner, 2001; Ross, 1999; Papyrakis and Gerlagh, 2007). There is also a vast array of case-study examples highlighting the potential perils of countries' extractive-led development. For instance, although historic examples often point to the role that Latin America's resource revenues played in supporting the rise of the Spanish empire, a more telling ending to this piece of history shows how, along these same lines, these revenues can also be detrimental to an economy's development.

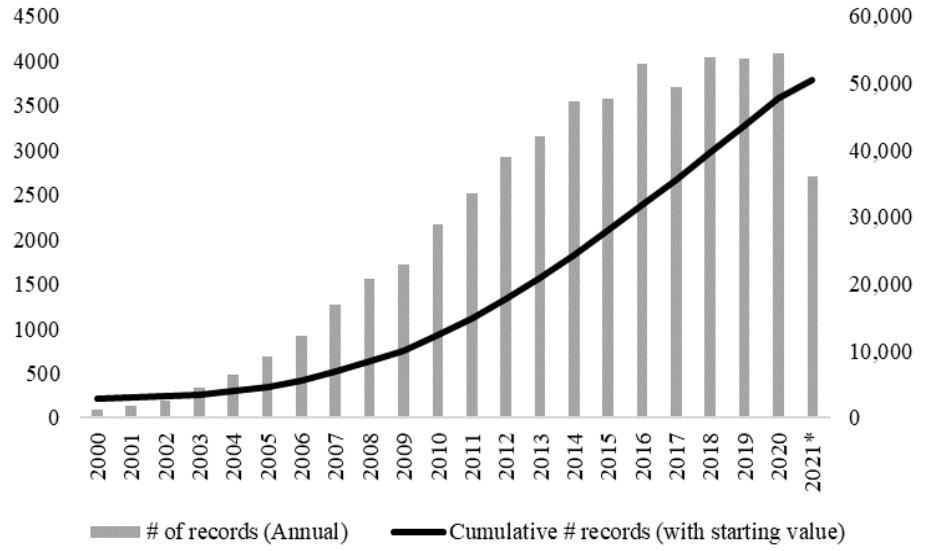
To elaborate on this point briefly, looking back at Latin America's colonial period, John Maynard Keynes (1930) argued that the subsequent inflow of mineral rents from the Americas eventually harmed Spain's domestic industries by raising wages above

competitive levels. This diverted factors of production away from other export industries (thereby delaying industrialisation) and toward the flourishing industries associated with trade in precious metals (much like the 'Dutch disease' discussed below) (Di John, 2011). By the end of the 16th century, the Spanish had become almost entirely dependent on the mining output of their Latin American colonies and had even begun using future mining output as collateral for borrowing. This left the Spanish economy vulnerable to recurring depreciations of metal prices at the end of the 16th century and the start of the 17th century. These low metal prices ultimately led to a string of defaults on Spain's foreign debts (in 1557, 1560, 1575, 1596, 1607, 1627, 1647, 1653 and 1680), and the resulting economic and political instability contributed to the eventual reversal of Spain's global economic dominance (Mau, 2012).

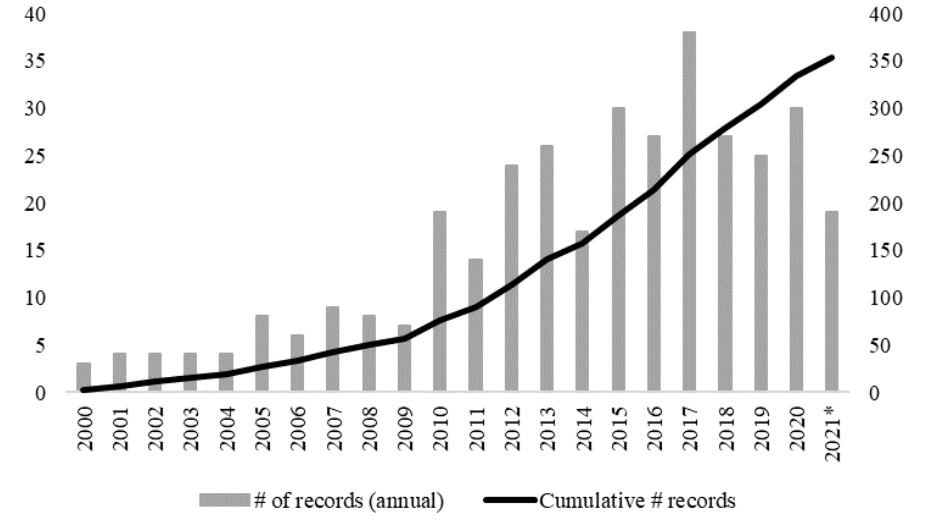
Among the many more contemporary examples, one notable case also describes how, in Mexico, an oil boom similarly resulted in excessive borrowing, an overheated economy, and the decline of industrial production (see Usui, 1997). Excessive borrowing during the late 1970s (fuelled by the Mexican government's expectations of increasing oil revenues) contributed to the 1982 Mexican debt crisis. Here, following the cyclical depreciation of oil prices in the early 1980s, Mexico's fiscal health quickly deteriorated as the country continued borrowing to maintain its public investment programme. Between 1978 and 1982, the debt-to-GNP (gross national product) ratio more than doubled (from 12% to 24.8%) as the peso also continued to devalue and the level of prices (captured by the consumer price index) increased by 2700%. By 1983, the Mexican economy had begun to contract; it remained stagnant for most of the rest of the 1980s following this period of economic upheaval and instability.

Figure 1. Graph of literature search results

a) Google Scholar search for "Resource Curse"



b) Studies on the effects of the extractive sector on socio-economic and other development outcomes published in economic journals



Notes: The literature search has been completed until July 2021. The sample of internationally acclaimed economics journals searched is available in Appendix A.1. It is informed by the Australian Business Deans Council Journal Quality List (ABDC JQL) and includes A* economics journals and a selection of A-rated journals specialised in resource and development economics.

Following this controversy regarding extractive-led development and the resource curse, scientific and policy interest in the mineral sector has grown over the last two decades. Figure 1a demonstrates the considerable expansion of the literature

dedicated to the resource curse. It shows that Google Scholar records a nearly 50-fold increase in the number of studies each year citing the term 'resource curse' since 2000. Cumulatively, it now finds more than 50,000 pieces of literature about the resource curse. These trends are also reflected in more detailed searches of the contents of economic journals. Figure 1b shows the results of a search for studies on the effects of the mineral sector on socio-economic and other development outcomes published in a sample of internationally acclaimed economic journals (see Appendix A.1).[4] The search identified a total of 353 articles published since 2000. Again, the annual rate of the publication of new literature shown in Figure 1b indicates an upward trend in academic interest in the subject (particularly since 2010). In fact, the average number of studies published annually more than quadrupled during this period (rising from nearly 6 per year between 2000 and 2009 to 25 per year between 2010 and 2020). The attention given to the resource curse has continued to attract academic interest for at least three reasons:

i) Explaining the resource curse and its societal implications

Research has provided various explanations and theories vindicating the resource curse. This includes several explanations concerning the crowding-out effects of minerals. The best-known explanation concerns the so-called 'Dutch disease', a phenomenon in which a windfall from the traded resource sector causes the real

[4] The search of more detailed economic journals also captures studies that do not use the term "resource curse". It allows for an alternative look at the level of academic interest on the topic that does not depend on studies using a specific term. The results in Figure 1b indicate the number of publications dedicated to this issue in this sample of journals have been increasing over time (not simply the use of the term "resource curse"). The sample of studies identified does not include policy discussions and studies on the optimal rate of extraction. The sample of internationally acclaimed economics journals searched is available in Appendix A.1. It is informed by the Australian Business Deans Council Journal Quality List (ABDC JQL) and includes A* economics journals and a selection of A-rated journals specialised in resource and development economics. The full bibliographic database of studies published in economics journals is available upon request.

exchange rate to appreciate and, in doing so, causes the non-resource traded sector to become globally less competitive while its returns also diminish (Torvik, 2001 and van der Ploeg and Venables, 2013).[5] In other words, such a windfall creates a period of de-industrialisation (crowding out the manufacturing sector in favour of the primary sector) as businesses and jobs move abroad to cheaper labour markets or to other parts of the domestic economy where returns are higher.

For structural theorists, such as Prebisch (1962), the issues related to the resource curse or Dutch disease could be explained by the declining terms of trade and destabilizing price volatility associated with economies' specialisation in primary products.[6] Others blame the long-term effects of the loss of growth-inducing technological advantages in the manufacturing sector (see Van Wijnbergen, 1984 and Krugman, 1987). Cherif (2013) presents a model asserting that less technologically advanced countries may be particularly vulnerable to the latter of these issues. He explains the extent of the crowding-out in the tradable sector depends positively on an

[5] The real exchange rate appreciation is caused by price increases in the non-traded sectors relative to the traded sector following the resource income windfall. Corden and Neary (1982) explain this can be caused by two types of effects: i) *The spending effect*, where the income shock increases aggregate demand. Increased aggregate demand has inflationary effects, leading to higher wages and higher prices in the non-traded sectors of the economy while traded sector prices remain constrained by international prices. ii) *The resource movement effect,* where the growing extractive sector draws capital and labour from other sectors of the economy. Reduced output in the non-traded sector causes the prices in this sector to rise while, again, the traded sector prices remain constrained by international prices.

[6] Bova et al. (2016) describe the challenges caused by large and enduring commodity market price swings; translating to greater output volatility, terms of trade volatility, and price instability. These factors are considered harmful to both investment and economic growth. Furthermore, periods of unexpected low commodity prices may reduce the income governments receive from the taxes or royalties associated with the export of these commodities. In response, this may cause greater fiscal volatility and pro-cyclicality as governments attempt to balance their books in this time of heighten economic stress. It is considered fiscal volatility and pro-cyclicality may exacerbate the business cycles volatility (Coutinho et al. 2013). For example, this may increase the intensity of the effects of the shocks as the aggregate demand supported by the public-sector decreases. Shabsigh and Ilahi (2007) also highlight that this may create inefficiencies from the burden of the added costs and wastage from shutting down programmes and projects during troubled times. Several studies now document arguments emphasising this volatility channel as a key explanation for extractive countries historically weak economic performance (see van de Ploeg and Poelhekke, 2010; Cavalcanti et al., 2015), their financial instability (Eberhardt and Presbitero, 2021), and inefficient public policies (Robinson et al., 2017).

interaction between the size of the resource windfall and the productivity gap vis-à-vis the trade partners.

Gylfason (2001) and Torvik (2002) and Baland and Francois (2000) describe some other well-known explanations concerning the crowding-out effects of extraction. For example, Gylfason (2001) suggests a mineral boom can cause a country to overestimate the importance of mineral wealth and undervalue the significance of human capital in its future prosperity. This causes it to neglect educational investment, which is recognised as an important factor of economic growth.[7] Ebeke et al. (2015) extend this point, also highlighting that resource revenues orient university students toward rent-seeking activities instead of productive ones. Torvik (2002) and Baland and Francois (2000), meanwhile, posit that a mineral boom can incur the resource curse because it diverts entrepreneurial talent away from growth-enhancing innovative activities in the economy.

Dependency theorists and Marxists provide alternative explanations for the resource curse. Dependency theorists argue that minerals are unlikely to stimulate growth when foreign multinationals dominate the extractive sector (as is the case in many countries) and are allowed to repatriate profits. Marxists offer similar arguments, highlighting that governments in poor economies are dominated by local elites whose interests are not aligned with national development, but rather with foreign multinationals' interests – thus making it unlikely that revenues and profits will be invested in ways that benefit local populations (Di John, 2011).

[7] E.g. Mineral booms often increase demand for task skilled labour and can pay relatively lucrative salaries. This may increase the opportunity cost of schooling, as well as devalue it in the economy. Mejia (2020) offers further evidence highlighting gold mining in Colombia reduced standardized test scores and college enrolment, particularly in academic degrees and STEM fields. Esposito and Abramson (2021) also document that regions in Europe that have historically mined coal have a lower share of people with a university education.

Otherwise, various studies further point to the wide range of potential negative externalities associated with extraction; for example, a broad range of literature is devoted to potential environmental and health risks. There are also many case studies valuing the economic costs associated with the environmental damages of oil spills and mining disasters, such as the Deepwater Horizon oil spill in the Gulf of Mexico in 2010 (see English et al., 2018) or the 2015 Mariana mine tailings disaster, which caused a toxic brown mudflow to pollute the river and beaches along the Doce River in Brazil (see Carrillo et al., 2020). More broadly, studies also examine the health impacts of extraction on local communities, in many instances showing a higher incidence of health conditions linked to heavy metal toxicity (such as anaemia among women and stunting in young children) (von der Goltz and Barnwal, 2019), as well as higher infant death rates and lower life expectancy (Edwards, 2016).

A recent trend in this literature has investigated the health and environmental implications of shale gas extraction. For instance, Hill (2018) reports increased low birth weight and decreased preterm birth weight among mothers living within 2.5 km of a well, and Hill and Ma (2017) find an increase in shale gas-related contaminants in community water systems within 1 km of shale gas wells. Alternatively, using an economic lens, other studies have examined the adverse economic effects of mining on residential quality of life via house prices. This research regularly highlights the negative impact of these types of health and environmental dis-amenities on residential house prices (e.g. Boxall et al., 2005; Neelawala et al., 2013; Gopalakrishnan and Klaiber, 2014; Koster and Ommeren, 2015; Malikov et al., 2018; Boslett and Hill, 2019; Boslett et al. 2019; Rivera, 2020; Gibbons et al., 2021).

Another adverse effect often associated with extraction is the link between mineral wealth and conflict. It has been found that the increased contestable income

from mineral rents may also incentivize violence by increasing the potential gains from appropriation (i.e. the rapacity effect) (Welsch, 2008; Dube and Vargas, 2013). Empirically, Caselli et al. (2015) show, for example, that the presence of oil has been a significant predictor of interstate conflicts since World War II, and Nordvik (2019) finds onshore oil production increases the chance of coups d'état. Alternatively, Dube and Vargas (2013) also found that increasing oil wealth was related to an increase in conflict in Colombia. Hodler (2006) describes the link between conflict and the resource curse, explaining that fighting reduces productive activities and weakens property rights (which also makes productive activities even less attractive).

Extending this point, Rettberg and Ortiz-Riomalo (2016) suggest that violent episodes in mineral-rich countries are more difficult to end and more likely to resume because of the resource-fuelled criminal networks that can develop under the auspices of armed conflict. They provide a detailed case study highlighting the interchangeable nature of gold mining revenues and the drugs trade as conflict resources in Colombia. Although conflict may well be a contributing factor to the purported association between minerals and crime, it is likely not the only reason linking them (e.g. other explanations suggest that changes in economic and demographic structures around mines may be contributing factors). For instance, Gourley and Madonia (2018) find a positive relationship between the presence of oil and gas wells and crime (both violent and property-related) in Colorado, United States. Andrews and Deza (2018) also report that increases in oil wealth in Texas (United States) were positively related to the incidence of murder, robbery, and larceny. Neither state's recent history has been characterised by violent civil wars or conflicts. Similarly, Buonanno et al. (2015) also highlight a historic example, noting the ascendance of the mafia in twentieth-century

Sicily following a rise in international demand for sulphur. They observe greater mafia presence in municipalities with greater sulphur availability.

However, most recently, political explanations for the resource curse (i.e. the 'political' or 'institutional' resource curse) have become central to discussions on the governance of natural resources in international development (Mehlum et al., 2006 and Robinson et al., 2006). Perturbed by the exacerbating role political elites themselves may have on the incidence of the resource curse, much attention has been paid to these theories among the international donor community. The political resource curse suggests that, in the face of a resource boom, politicians are more likely to enact inefficient policies that increase their likelihood of remaining in power or of directly benefiting from the resource rents (Robinson et al., 2006; 2014). For example, extraction is suggested to lead to an increase in nepotism, patronage, and corruption because the political elite have more opportunities to grab rents from the increased public revenues without upsetting a rational but imperfectly informed public (Brollo et al., 2013).[8] Several studies suggest that this, in turn, leads to an institutional environment that can impede democracy, undermine fiscal capacity development, and diminish bureaucratic quality (e.g. Bulte et al, 2005; Cassidy, 2019; Lashitew and Werker, 2020).

Like many of the other explanations provided, empirical studies also provide further evidence of the existence of the political resource curse. For example, Vicente (2010) finds vote-buying significantly increased following the discovery of oil in the African island nation of São Tomé and Príncipe. Similarly, cross-country research by Klomp and de Haan (2016) infers that political incumbents use these rents to expand

[8] This also relates to the issue that resource revenues create a fiscal base which decreases the need for the state to tax the local population and, thereby, also reduces political bargaining power and accountability between the state and the local populous.

public spending and reduce taxes before elections to improve their chance of re-election. Alternatively, Caselli and Michaels (2013) offer evidence from the Brazilian media and federal police documenting that mineral production is related to increases in the number of alleged instances of illegal activities associated with mayors. Brollo et al. (2013) also show that windfalls increased observed corruption in Brazil while also reducing the average education of political candidates. Furthermore, a study by Bhavnani and Lupu (2016) also finds that resource windfalls increase the prevalence of clientelism among politicians in Brazil; Asher and Novosad (In Press) provide evidence that such windfalls cause elected politicians to accumulate more wealth and commit more crimes in India; and Zhan (2017) reports that resource dependence increases corruption among state employees in China.

Finally, Collier (2017) adds further critical insight here, arguing that ordinary citizens also play a part in fulfilling the resource curse. He explains that the psychological biases caused by the economic premise of extractive-led development drive citizens' preferences excessively towards consumption rather than the investment of resource revenues. This creates the conditions for a type of mineral populism to politically prevail, wherein voters reward policies and politicians who support the overprovision of short-term goods and services (Matsen et al., 2016). Neumayer (2004) and van der Ploeg (2011) suggest the 'curse' is partly due to unsustainable overconsumption and that resource-rich developing economies appear unable to successfully convert their diminishing exhaustible resources into other productive assets. This view is supported by Papyrakis and Gerlagh (2007), who consider this investment channel (or lack thereof) to be an important factor explaining the resource curse. Usui (1997) claims, for example, that Mexico's underperformance

after its oil boom in the 1970s was related to its bias towards immediate spending rather than capital investment.

ii) Exploring empirical controversy concerning the so-called 'curse'

This topic has also continued to attract academic interest due to the empirical controversy surrounding the estimates that studies use to identify the resource curse phenomenon. Whether the extractive sector has had a positive or negative net effect on countries' development remains a point of rigorous debate; one key aspect of this debate concerns the variable used to measure the extractive sector's effect. Whereas early studies on the subject largely followed Sachs and Warner's (2001) pioneering study on the resource curse by measuring the value of extraction rents as a proportion of total economic output (i.e. their *resource dependence*), the seminal work by Brunnschweiler and Bulte (2008) favoured a per-capita measure (i.e. *resource abundance*) and found that resource abundance positively affects both economic growth as well as the development of institutions.

A related point for debate has concerned the exogeneity (or endogeneity) of variables measuring the effects of the extractive sector. Van der Ploeg and Poelhekke (2017) refer to an array of factors – including fluctuating economic variables as well as political and institutional regimes – correlated with mineral production that could bias estimates if not properly accounted for. Although some researchers have argued that resources are randomly distributed among countries (e.g. Andersen and Aslaksen, 2008), conflicting evidence has continued to mount over time. Here it is explained that mineral exploration and production are determined by various endogenous, unobserved, and hard-to-measure factors. For instance, David and Wright (1997)

describe the competitive advantage that some economies, such as the U.S., have in the extractive sector due to technological superiority and high institutional quality. Brunnschweiler and Poelhekke (2019) also highlight the importance of legal structures, and Cassidy (2019) finds that countries with higher-quality political institutions and greater fiscal capacity disproportionately select into mineral production. Table 1 provides a list of further studies pointing to a wide range of legislative, regulatory and economic factors affecting the development of the extractive sector.

This has motivated the search for natural experiments and sub-national studies exploiting, for example, institutional history and reforms (e.g. Dell, 2010; Nishijima et al., 2020; Crost and Felter, 2020), geographic borders (e.g. Caselli et al. 2015), technological developments in the shale-gas sector (e.g. Weber, 2012 and Zuo et al. 2019) and endowment discoveries (e.g. Vicente, 2010; Smith, 2015; Gehring and Schneider, 2020) to identify the effects of the sector. Other approaches also examine responses in outcomes to mineral price shocks (e.g. Berman et al., 2017 and Gradstein and Klemp, 2020). However, such approaches are often based on isolating the effects of mining activities or areas that do not impact world commodity prices. Pellegrini et al. (2021) further used the synthetic control method to compare the outcomes of the Italian region of Basilicata to other regions in Italy following the expansion of that region's oil production in the early 1990s.

Table 1. Selection of articles on the determinants of mineral resource development in economics journals

Author(s)	Title
Balthrop and Schnier (2016)	A regression discontinuity approach to measuring the effectiveness of oil and natural gas regulation to address the common-pool externality
Boyce and Nøstbakken (2011)	Exploration and development of U.S. oil and gas fields, 1955–2002
Cologni and Manera (2014)	On the economic determinants of oil production: Theoretical analysis and empirical evidence for small exporting countries
Cust and Harding (2020)	Institutions and the location of oil exploration
Kim and Oliver (2017)	Taming drillers through legislative action: Evidence from Pennsylvania's shale gas industry
Kunce et al. (2004)	Environmental and land use regulation in nonrenewable resource industries: Implications from the Wyoming Checkerboard
Leonard and Parker (2021)	Fragmented Ownership and Natural Resource Use: Evidence from the Bakken
Levitt (2016)	Information spillovers in onshore oil and gas exploration
Maguire (2012)	Prices or politics? The influence of markets and political party changes on oil and gas development in the United States
Melstrom (2017)	Where to drill? The petroleum industry's response to an endangered species listing
Mohn and Osmundsen (2008)	Exploration economics in a regulated petroleum province: The case of the Norwegian Continental Shelf
Slade (2015)	The rise and fall of an industry: Entry in U.S. copper mining, 1835–1986

Notes: The literature search has been completed until July 2021. The list of internationally acclaimed economics journals is available in Appendix A.1. It is informed by the Australian Business Deans Council Journal Quality List (ABDC JQL) and includes A* economics journals and a selection of A-rated journals specialised in resource and development economics.

Several instrumental variables have also been proposed to account for the potentially endogenous nature of rents from the extractive sector. Some of the most recent advancements in this vein have further considered the geological conditions for the formation of minerals. For example, Fernihough and O'Rourke (2014; 2021), Cassidy (2019), and Bazillier and Girard (2020) consider the use of geological rock layers (or strata) conducive to mineral formation as instruments. Alternatively, as an exogenous source of variation in coal extraction in nineteenth- and twentieth-century Europe, Esposito and Abramson (2021) use the formation of coal deposits located on the earth's surface.

Overall, the literature on the resource curse has offered mixed and often conflicting conclusions about the prevalence of this purported phenomenon. A recent meta-analysis by Havranek et al. (2016) reports that approximately 40% of empirical papers estimate a negative effect, 40% find no effect, and 20% find positive effects. However, they find that this evidence is characterised by considerable method heterogeneity (as indicated above), as well as potential publication bias. When these factors are taken into account, they argue, the evidence base for the resource curse hypothesis is revealed to be weak.

iii) Discussing policy and interventions

The third reason this topic has continued to attract academic interest concerns the interventions and policy responses that should be taken to help economies manage their extractive sectors and the societal issues associated with them. Papyrakis (2017) explains that, collectively, research on the resource curse emphasises the many complexities and conditionalities of the phenomenon. If the resource curse indeed

exists, it is largely context-specific and dependent on socio-political institutions as well as the sector's linkages with the rest of the economy. For example, research indicates that the resource curse may be a particularly relevant issue in settings of low institutional quality (Olsson, 2007; Butkiewicz and Yanikkaya, 2010; Daniele, 2011; Ebeke and Etoundi, 2017). Many studies even indicate that the curse has been reversed – becoming an economic blessing – in many high-quality institutional settings (Wen and King, 2004; Mehlum et al., 2006; Cabrales and Hauk, 2010; Libman, 2013; Boschini et al., 2013; Dauvin and Guerreiro, 2017).

While some studies have further emphasised the need for institutional checks and balances to support policymaking (e.g. Collier and Hoeffler, 2009), others highlight the potential positive effects of institutional reforms in this context. For example, Harris et al. (2020) show that bureaucrats provided with information about mining revenues are more likely to disapprove of spending practices that benefit political supporters and oppose the political use of revenues generated from the sector. Similarly, Gallego et al. (2020) find that a reform in Colombia promoting greater equality for municipal access to resource revenues, as well as saving for the future, had an appreciable effect on local development outcomes (including reducing poverty and improving employment, housing conditions, health, and education).

In this respect, even many ardent proponents of the extractive-led development imperative (i.e. those who do not appreciate or agree with the hypothesis on the net effects of extraction put forwards by the resource curse literature), can be swayed by the policy relevance of many of the issues identified. Many of the issues highlighted by the literature, even if they do not entirely reverse the economic effects of extraction, may diminish the overall benefits or create challenging conditions to govern. For example, many countries are challenged by the fiscal and economic volatility caused

by fluctuating commodity markets (particularly during cyclical depressions). This in itself creates public management and budgeting issues. Often, proponents of extraction also recognise the need to mitigate the sector's association with societal issues such as environmental damage and corruption. For instance, van Alstine (2017) describes a particularly well-known case in Angola where the private oil companies were found to be complicit in assisting politicians to plunder public assets during its civil war in the 1990s. The reputational and business risks these incidents can pose are commercially significant and a degree of ethical and social responsibility also exists here.

Overall, this has stimulated a diverse range of policy options, each tackling different aspects of the problems that arise surrounding extraction. For small economies with large endowments of resources (such as Norway), the fiscal and monetary aspects of the wealth generated by the sector have been central issues. The adoption of fiscal saving rules and counter-cyclical investment funds have historically been hot topics for debate (van der Ploeg and Venables, 2011; Arezki and Ismail, 2013; Cherif and Hasanov, 2013). However, in more recent years, other issues regularly raised concern formalization (Cote and Korf, 2018; Pokorny et al., 2019), local content policies (Geenen, 2019), and enhancing transparency and accountability in the management of the mineral sector (Kolstad and Wiig, 2009). Although many of these issues feature in strategies advocated by the international community to help address the problems created by extraction, critics maintain that they often remain poorly understood in practice (van Alstine et al., 2014).

1.5 Outline and contributions of this thesis

This thesis aims to contribute to the research enhancing our understanding of extractive-led development and policy in the following four empirical chapters. The first empirical chapter (Chapter 2) of the thesis is devoted to helping extend current thinking on the potential effects of this extractive-based development imperative on citizens' expectations and life satisfaction. This draws on a contemporary stream of economic literature pointing to the 'psychological effects' of the mineral sector. Here theory speculates that the economic potential of the mineral sector may inflate citizens' economic expectations and, due to an upward shift in aspirations, cause a degree of dissatisfaction. Using survey data from 18 Latin American countries, this chapter presents a novel econometric analysis documenting the presence of the 'euphoric effect' of the mineral sector on citizens' economic expectations. However, it does not detect a significant relationship with citizens' reported life satisfaction.

Next, despite the heightened rhetoric about the potential economic benefits of extraction, over the last two decades, there has also been increasing interest within the scientific community on the 'resource curse' and the governance issues arising in the extractive sector. Consequently, much hope has been placed on the creation of 'good governance standards' in transparency and accountability as a means to help combat these problems. This has culminated in the ascendancy of the Extractive Industries Transparency Initiative (EITI), which is now recognised as the leading international standard and hallmark transparency scheme in the extractive sector. The EITI requires its member countries to abide by financial and contractual disclosure standards and maintain a public feedback mechanism in the form of a national multi-stakeholder group, and the initiative also uses an audit system to validate members'

compliance with its disclosure standards and ensure that its transparency requirements are upheld.

Chapter 3 presents a novel assessment of the relationship between EITI membership and countries' progress in tackling corruption. It provides the first study looking at this issue using a 'state-of-the-art' indicator called the Bayesian Corruption Indicator (BCI). It also introduces an innovative estimation strategy combining entropy balancing with a difference-in-difference framework to address the baseline inequalities that exist between member and non-member countries. Contrary to the findings of many leading studies, this analysis finds that corruption scores have improved significantly among EITI member countries. In particular, the evidence is strongest when we examine a sub-group of EITI members designated as fully compliant with the initiative's transparency standards.

Chapter 4 continues exploring the purported benefits of the adoption and implementation of the EITI. Here it examines the EITI's role in helping build public trust in politicians. In doing so, it presents the first known econometric investigation studying the relationship between the EITI and trust. It also uses a novel instrument exploiting the variation in neighbouring countries' EITI participation to control for the endogenous nature of one's own EITI involvement. The basis of this instrument reflects on a broader literature concerning the historic influence of policy-borrowing in the geographical diffusion of public policies. The results show a positive relationship between countries' EITI membership and trust in politicians. In particular, estimates offer consistent evidence of significantly improved levels of trust among members that are compliant with the EITI's transparency standards.

Following on from this, it is explained that a central assertion underpinning transparency initiatives in the extractive industries is that they can generate and

sustain demand for information about the sector. However, very little is currently known about the demand for information following concerted efforts to enhance transparency in the extractives sector or about the factors that are related to the variation in demand for information (i.e. considering when and where demand accrues).

Using a new dataset on global demand for information from the website of the EITI, Chapter 5 provides a novel study tracking demand for information from a transparency initiative in the extractive industries both through time and across different countries. Overall, it finds that aggregate global demand for information follows secular patterns in global mineral prices. This highlights the initiative's potential susceptibility to trends in the public's policy interests. Cross-country regressions also show that demand for information appears to be higher among wealthier, more open economies with lower perceived levels of corruption and higher levels of accountability. This contrasts with the expected beneficiaries of the EITI scheme, and it points to the need for improved communication strategies that target countries with weaker and more challenging institutional settings.

The thesis concludes in Chapter 6 with a discussion of this research. It includes a discussion of its main findings and the policy-related points it raises. It also considers further some of the caveats and limitations of this research. With this in mind, the conclusion points towards future avenues for research and opportunities to continue to progress this research agenda on extractive-led development, the role of transparency and accountability policy in the governance of the sector, and the methodological issues that have arisen during the process of completing this thesis.

Chapter 2.

Is there a Mineral-Induced 'Economic Euphoria'?: Evidence from Latin America

A development imperative emphasising the economic benefits of mineral extraction has led researchers to speculate about whether minerals inflate citizens' economic expectations and, due to an upward shift in aspirations, thereby cause a degree of dissatisfaction. Using survey data from 18 Latin American countries, this study finds evidence of the 'euphoric effect' of minerals materialising among citizens' expectations concerning future changes in the economic situation of their country. Similarly, it also finds a positive and significant relationship with expectations concerning future changes in respondents' personal economic situation. However, it does not detect a significant relationship between minerals and citizens' life satisfaction.

Keywords: Expectations; Extractive Industries; Resource Curse; Satisfaction

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2.1 Introduction

The extractive sector has played a significant role in Latin America's economic history. The global increase in energy and commodity demand has seen Chile, Peru, and Bolivia become leading exporters of raw materials (such as copper and tin), while Venezuela, Brazil, Mexico, and Colombia have also turned into major players in the global oil market. Consequently, much attention now surrounds an extractive-based development imperative in the region. This imperative emphasises the potential economic benefits that extractive industries may bring to the region's modern economies (Arsel et al., 2016).

The arguments put forward by this extractive-based development imperative are also very compelling for many. In one iconic example, Mexican cartoonists depicted the oil sector as a descending guardian angel and a new Virgin of Guadalupe (Grayson, 1981). However, a contemporary stream of thinking now further points toward the influence that this economic rhetoric may have on citizens' economic expectations (Toews, 2015; Frynas et al., 2017; Collier, 2017; Cust and Mihalyi, 2017). In particular, Collier (2017) suggests that the 'psychological effects' of countries' extractive activities have inflated many citizens' expectations. Toews (2015) also theorises a link between increased mineral rents, heightened expectations, and citizen dissatisfaction.

Empirical evidence for these relationships is limited at present (Toews, 2015 and Cust and Mensah, 2020). Therefore, this study further explores the relationship between the mineral sector and citizens' economic expectations and satisfaction by evaluating public opinion data collected over 16 years from individuals across 18 Latin American countries, namely: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica,

Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Peru, Uruguay, and Venezuela.

First, this study looks at the relationship between the mineral sector and respondents' reported expectations for changes in their country's economic situation as well as their expectations for changes in their own economic situation. The distinction between the two types of expectations is important in this research because individuals may expect that minerals can improve the economic prospects of the country, on average, but not necessarily their own prospects if the benefits accrue to a small minority/the elite. If this interpretation is accurate, it may provide some explanation towards understanding the clamour for public consumption of mineral revenues and the breakdown in state–society relations seen in many resource-rich countries (Collier 2017).

Second, this study examines the relationship between the mineral sector and citizens' life satisfaction. This builds primarily on Toews' (2015) exposition on the potential link between mineral wealth, expectations, and citizen satisfaction. However, it also contributes to the burgeoning literature probing into the determinants of citizen satisfaction. This includes a large body of literature examining the purported positive relationship between income and satisfaction (Zee Ma and Zhang, 2014), as well other economic factors such as inflation (Di Tella et al., 2003), unemployment (Blanchflower et al. 2014), and international trade (Bjørnskov et al., 2008). Although much ambiguity exists regarding the precise relationship between these factors and satisfaction, many of the intricacies of these issues are discussed in further detail in reviews of the field (e.g. Clark, 2018). For instance, the controversies caused by the so-called 'Easterlin paradox' suggests that the positive effects of income on satisfaction may diminish at sufficiently high levels of income (Easterlin, 2015). Otherwise, studies

in this literature also regularly explore the explanatory power of individuals' characteristics such as age, gender and education on satisfaction (further discussed below) (Oshio, 2017).

In this vein, this study contributes to a new strain of this literature on the determinants of satisfaction related to a paradox dubbed the '*happiness resource curse*' (Ali et al., 2020). Here recent cross-country research indicates that a negative correlation exists between happiness and mineral rents when comparing average satisfaction levels between countries (see Ali et al., 2020; Mignamissi and Kuete, 2021). However, from these studies, it is difficult to discern the degree that these correlations may be susceptible to the various statistical fallacies to which aggregated (averaged) data are prone (Woodhouse and Goldstein, 1988; Aitkin and Longford, 1986; Zee Ma and Zhang, 2014).[9] This study benefits from access to a rich database of individual-level data to examine satisfaction outcomes. It is very much in the same ilk of studies as the vintage piece by Di Tella et al. (2003) on 'The Macroeconomics of Happiness'.

Overall, this study finds evidence of a mineral-induced 'euphoric effect' materialising among citizens' expectations concerning changes in the economic situation of their country and changes in their personal economic situation. However, it does not detect a corresponding significant relationship between minerals and citizens' life satisfaction such as that hypothesised by either Toews (2015) or the broader literature on the happiness resource curse. This chapter continues in Section 2.2 with a review of synergies linking minerals with economic expectations and

[9] Simpson's paradox provides one good example here (Simpson, 1951). Recall that Simpson's Paradox is a situation where the relationship between two variables is reversed in comparisons using aggregated (averaged) data. Of course, in practice, the relationship is not always completely reversed (e.g. significant relationship may simply become insignificant or the sign and significance may not change at all).

satisfaction. Section 2.3 then provides more details of the study's methodology and Section 2.4 presents the results of the empirical analysis. Finally, Section 2.5 summarises the study's findings and provides concluding remarks with respect to future research.

2.2 Minerals, Economic Expectations, and Satisfaction

Many economic arguments posit that the revenues derived from the extraction of minerals can constitute a major shock to national wealth (i.e. spurring economic activity). This includes numerous well-known growth models emphasising that these revenues may provide economies with the investible funds needed to improve local infrastructure and public services as well as to provide capital to industrialise or develop infant industries (e.g. Rostow, 1960; Hartwick 1977; Balassa, 1980). A related argument, based on the Harrod–Domar model, also suggests that these revenues may help to plug the financing gap in many developing economies and start a self-sustaining process of capital accumulation and economic growth (Easterly, 1999). Ali et al. (2020) state that, in principle, this means mineral rents may be positively related to satisfaction where they can be used to invest in welfare-enhancing activities.

However, the increased economic opportunities related to the extraction of minerals are leading scholars to believe that these ideals may be inflating citizens' economic expectations (Frynas et al., 2017), and some have considered the potential implications of these issues. For example, Collier (2017) describes that exaggerated expectations among citizens may build appetites for increased spending. Others highlight that inflated expectations may explain a common predisposition among citizens toward 'mineral populism' (encouraging voters to elect politicians who make overly ambitious promises about mineral revenues; e.g. Stolan et al., 2017). It is also

thought that these issues may incite contestations of power (which can affect state functioning and trust in public governance; e.g. discussions by Tyce, 2020, and Fenton Villar, 2020). Alternatively, Toews (2015) suggests that these heightened expectations may cause an upward shift in individuals' aspirations, thereby precluding them from deriving a degree of economic satisfaction.

Despite increasing speculation concerning the relationship between mineral extraction and expectations, a country's mineral wealth does not inevitably inflate citizens' expectations. The literature dedicated to an empirical phenomenon widely known as the 'resource curse' further reports on the relative economic underperformance of many mineral-dependent economies (Gilberthorpe and Papyrakis, 2015). In this respect, the literature dedicated to the resource curse also describes some of the difficult realities that may confront economies dependent on mineral extraction in terms of increased political conflict, corruption, economic volatility, de-industrialisation, environmental degradation and fitful fiscal spending (e.g. Papyrakis and Pellegrini, 2019).

These same issues indicate the many reasons citizens may become dissatisfied with economic activity related to the mining sector (Ali et al., 2020). For instance, there is often public apprehension concerning local communities' potential vulnerability to the environmental and health liabilities associated with mineral extraction. For example, considerable environmental concerns arose surrounding deep-water oil activity in Brazil's Foz do Amazonas Basin due to its environmentally sensitive ecosystems and nearby coral reefs. Environmentalists in the region highlighted that leaked oil could devastate local environments in Brazil's northern state of Amapá (which is home to the world's largest belt of mangroves as well as thousands of square miles of rainforest; see Nogueira, 2017). Recent environmental

studies from Latin America have also highlighted some of the livelihood issues arising from extensive contamination of soil and vegetation due to mineral extraction (e.g. Barraza et al., 2018). Such problems may weigh down on individuals' satisfaction because they create a cause for concern for their environment. For some, these concerns are so compelling that they even spill over into mass protests and violent conflict (e.g. Haselip, 2011).

However, quantitative evidence examining the 'euphoric effects' of minerals on citizens' economic expectations or its relationship with citizen satisfaction remains limited (and none yet focused on Latin America). Among the evidence available, Toews (2015) first examined the effects of world oil prices on household income satisfaction in Kazakhstan between 2001 and 2005, theorising a link between expectations, aspirations, and satisfaction with income. He found that households located closer to an oil field report a significantly lower level of income satisfaction following oil price increases.[10] Since this analysis, cross-country studies have also found a negative correlation between mineral rents and income satisfaction when comparing average satisfaction levels between countries (see Ali et al., 2020; Mignamissi and Kuete, 2021).

Further to this, the results of a recent lab-in-the-field experiment in Mozambique by Armand et al. (2020) have shown that disseminating information about mineral wealth increased citizens' optimism about the future. Cust and Mensah (2020) have also studied the effects of oil discoveries on citizens' expectations in Africa. Assuming that oil discovery announcements and households reported expectations are not subject to calendar effects, their findings indicate that expectations concerning changes in the economy and their living conditions increased

[10] An updated version of Toews' (2015) empirical analysis is provided by Girard et al. (2020).

in the months following a discovery. Meanwhile, Paler et al. (2020) reports that expectations concerning the future benefits of oil are higher among voters in oil constituencies in swing states in Uganda. However, they caution that the data is observational and cross-sectional and, as such, does not capture the causal effects of oil.

2.3 Methodology

This study contributes to this literature by offering a novel empirical analysis examining the euphoric effects of the extractive sector's economic activity on citizens' economic expectations and its relationship with life satisfaction in Latin America. This section provides details of the study's estimation strategy and data, and the next section presents the results of the analysis.

Identifying the effects of the mineral sector

Despite decades of research, questions concerning the effects of the extractive sector on social, political, and economic outcomes remain largely unresolved (Gilberthorpe and Papyrakis, 2015). Much of the disagreement owes to the difficulty of identifying some degree of exogenous variation in countries' mineral wealth to consistently identify the effects of the extractive sector (Cassidy, 2019). Mineral exploration and production are determined by various endogenous, unobserved, and hard-to-measure factors. For instance, David and Wright (1997) describe the competitive advantage that developed economies such as the U.S. have in the extractive sector due to their technological superiority and high institutional quality. Brunnschweiler and Poelhekke (2019) also highlight the importance of legal factors and ownership structure. More broadly, van der Ploeg and Poelhekke (2017)

generalise these issues and refer to a multitude of factors – from political and institutional regimes to fluctuating economic factors – that may be correlated with both the size of an extractive sector and outcome variables. They explain that estimates inevitably suffer from bias caused by omitted variable biases and confounding variables.

To resolve this estimation problem, some studies have recently explored a promising approach that instruments countries' mineral rents with their endowment of sedimentary land (e.g. Cassidy, 2019 and Mahdavi et al. 2020). To add context here, Cassidy (2019) explains that a geological pre-requisite for the formation of oil reservoirs includes source rocks (a sedimentary rock deposited by algae and zooplankton millions of years ago), which form in sedimentary basins. It is also the case that sedimentary basins are home to numerous other deposits. For example, nearly all of the world's coal as well as many metal ores are found in sedimentary rock (Wright, 1985; Kyser, 2007; Cathles, 2019). Sedimentary basins are, therefore, a time-invariant geological factor that determines countries' prospective mineral endowments.[11]

However, using sedimentary basins as an instrument in this instrumental variable (IV) approach assumes that sedimentary basins affect an outcome variable only indirectly (i.e. through mineral rents). This is known as the 'exclusion restriction'. Several concerns exist with this IV approach in this context. One important issue here is that the extractive sector's activity in sedimentary basins may influence expectations

[11] Some other studies have also used geological layers as a means of identification. For example, more recently Bazillier and Girard (2020) have used the geoglogical layer determined by the Birimian volcano-sedimentary basin in Burkina Faso to capture the effects of informal (unregistered) gold mines. Alternatively, Fernihough and O'Rourk (2014) present a natural experiment using the proximity of European cities to rock strata from the Carboniferous era to examine the population effects of coal-fields between 1750 and 1900.

by means other than the rents they generate. For instance, extractive companies' activities securing and locating prospective mineral endowments in sedimentary basins can directly draw public attention towards the sector; this often coincides with the early onset of mineral-related political rhetoric and public debate (Arezki et al., 2017; Cust and Mihalyi, 2017; Mihalyi, 2020). Haselip (2011) further provides an example here describing the community consultation process for developing oil in the Peruvian Amazonia, emphasising that public interest in the extractive sector's activity in sedimentary basins can begin a long time before either the extraction or formal exploration for minerals even starts.

Methodologically, this study poses a novel way of building on and adapting Cassidy's (2019) explanations about the relevance of sedimentary basins to the mineral sector to assess the effects of its activity. This approach contrasts with that of previous studies, such as Cassidy (2019) and Mahdavi et al. (2020), which assumes that the sector's activity in sedimentary basins affects outcomes only through minerals rents (i.e. at the point of production). It is based on the understanding that the mineral-focused rhetoric in Latin American societies, which potentially affects individuals' expectations and satisfaction, is jointly determined by both rents from mineral extraction as well as countries' endowments of land in sedimentary basins that determine their prospective mineral resources. This reflects explanations, such as those by Reiss (1990), that the extractive sectors economic interests (e.g. capital expenditure) extend beyond activities related to immediate production and also encompass exploration for prospective mineral endowments.

Furthermore, here it is hypothesised that these factors may also interact to some degree. In other words, the effects of mineral rents on expectations and satisfaction may vary according to countries' endowments of land in sedimentary

basins (and vice versa). One reason explaining why these factors may interact includes that the added interest arising from commercial activity related to prospective mineral endowments in sedimentary basins could help to reinforce economic expectations concerning current rents. For example, as highlighted by Haselip's (2011) case study, public interactions on future developments may also influence the public's experience and expectations of existing extractive activity. Alternatively, looking at this another way, the extractive sector may hold more political clout in economies that are more dependent on its rents. This political clout, in turn, may allow extractive companies to push their commercial interests higher up the public agenda (causing greater interest in their activity to develop prospective mineral endowments in sedimentary basins, ceteris paribus).

Given this hypothesis, the econometric specification used in this study involves regressing measures of individual expectations and satisfaction on the interaction between a measure of a country's mineral rents and a measure of its land in sedimentary basins. Whereas mineral rents are considered to be endogenous (see above), after controlling for country-fixed effects, the sedimentary basin variable is exogenous. This interaction term is potentially very interesting here because the coefficient of an interaction term between an endogenous variable and an exogenous variable is consistent, as long as the endogenous variable is controlled for in the regression (e.g. Bun and Harisson, 2018). Thus, this interaction term may yield important insights into a degree of variation in the outcomes caused by the time-varying effects of countries prospective mineral endowments. The effects caused by prospective mineral endowments have seen a notable increase in attention in recent years, but it remains an issue we know little about (Mihalyi, 2020).

Furthermore, this interaction effect also provides estimates from which we may speculate about the direction of the sector's overall effect. Of course, no research in this context is infallible (all studies are affected by some limitation or untestable assumption – e.g. about exclusion restrictions to justify their claims about the estimated effects of minerals), and by looking at only the interaction term, we are limited in what we might infer about the magnitude of the full marginal effect of the extractive sector.[12] However, speculating about the sign of overall effects from the variation caused by the interaction term appears relatively reasonable given the above discussion justifying the interaction term. It suggests the interaction term is expected to increase the extent of the rhetoric towards the extractive sector and magnify the sector's effects on outcomes. To summarise this point: although we may not be able to detect the full magnitude of the effects of the extractive sector from this approach, it is not necessary for interpreting the interaction term (which also provides us with important insights into the effects of the sector).

Data

This study collates data on expectations from a repeated cross-section public opinion survey covering individuals from 18 countries in Latin America. The survey, conducted by national polling firms, compiles nationally representative data from between 1000–1200 respondents per country per year and has been centralised by the Latinobarómetro database since 1996. This analysis focuses on collating and analysing survey responses between 2001 and 2017 due to the availability of variable data for expectations described below.

[12] Although, if the total effect of the sector is determined by activity related to both production and prospective endowments in sedimentary basins, this limitation is no different to any study that estimates the effects of rents (could they consistently estimates the effects with some exogenous degree of variation).

Our particular focus on Latin America is driven by the region's prominent public debates concerning the role of mineral extraction in development (e.g. Pellegrini, 2018). The region's pervasive public interest and political rhetoric towards the extractive sector make it an ideal testing ground to explore the relationship between mineral extraction and ordinary citizens' expectations. However, another reason justifying our interest in this dataset reflects that, compared to other public surveys (including those compiled outside of Latin America – such as other geographic regions' Latinobarómetro datasets), the frequency of this (almost) annual survey provides a rich dataset from which we may also examine how expectations evolve with time.[13]

Using the data available from the Latinobarómetro database, this study examines two outcome variables directly related to respondents' economic expectations. The survey questions from which these variables derive ask respondents whether they expect changes to: i) the economic situation of their country in the coming 12 months (**Country Exp.**) and ii) their own personal economic situation in the coming 12 months (**Personal Exp.**). Scaled from 1 to 5, the original ordering of the survey responses is reversed so that larger values indicate a more optimistic outlook. Thus, the values 1, 2, 3, 4, and 5 indicate that one expects the economic situation to 'get much worse', 'get a little worse', 'stay about the same', 'get a little

[13] The dataset contains gaps for years where the survey was not conducted, or a survey question was not asked. The gaps that exist within this dataset are relatively minor (with data absent only for a few years of the entire study period). The frequency and consistency of the data makes the Latinobarómetro an extremely advantageous data source in the sense that, compared to other datasets with expectations data available from cross-national surveys (inc. other regions Barometer datasets – which are typically available every 3-4 years), the frequency of this data provides a much greater degree of variation from which we may examine how responses evolve over-time. This is suited to our methodological approach using country-fixed effects. This approach limits the degree of variation used to infer estimated effects but controls for time-invariant unobserved factors (such as innate cultural history and geographic and geological factors) which would otherwise confound our analysis and are very difficult to accurately measure or completely capture in a regression model.

better', and 'get much better', respectively. Table 2 further reports descriptive statistics for these indicators, and Appendix B.1 provides further details for each variable.

Table 2. Descriptive Statistics

Variables	Obs.	Mean	Std. Dev.	Min	Max
Country Exp.	252,568	3.003	1.058	1	5
Personal Exp.	272,497	3.375	0.964	1	5
Life Sat.	273,583	2.983	0.837	1	4
Min. Dep.	292,755	0.048	0.061	0	0.315
Min. per capita	292,755	4.579	2.643	0	8.511
Oil Dep.	292,755	0.030	0.053	0	0.305
Oil per capita	292,755	3.228	2.961	0	8.478
Basin	292,755	0.491	0.212	0.116	0.992
Min. Dep.* Basin	292,755	1.957	2.736	0	15.597
Min. per capita* Basin	292,755	2.078	1.394	0	4.369
Oil Dep.* Basin	292,755	1.340	2.486	0	15.118
Oil per capita* Basin	292,755	1.480	1.562	0	4.301
Age	292,755	39.717	16.395	16	99
Male	292,755	0.487	0.499	0	1
Civil Status					
Married	291,167	0.569	0.495	0	1
Single	291,167	0.316	0.465	0	1
Separated	291,167	0.114	0.318	0	1
Socio-economic status					
Very bad	292,749	0.034	0.181	0	1
Bad	292,749	0.146	0.353	0	1
Not bad	292,749	0.422	0.493	0	1
Good	292,749	0.324	0.468	0	1
Very Good	292,749	0.072	0.259	0	1
Education					
Primary	292,723	0.495	0.499	0	1
Secondary	292,723	0.344	0.475	0	1
Higher	292,723	0.159	0.365	0	1
Log GDP pc	292,755	9.221	0.499	8.102	10.013
GDP Growth %	292,755	2.415	3.424	-11.854	16.261
Trade Openness	292,755	63.901	27.43	21.852	166.698
Unemployment	292,755	6.496	3.309	2.219	19.590
Inflation	292,755	7.864	7.746	-4.620	45.943

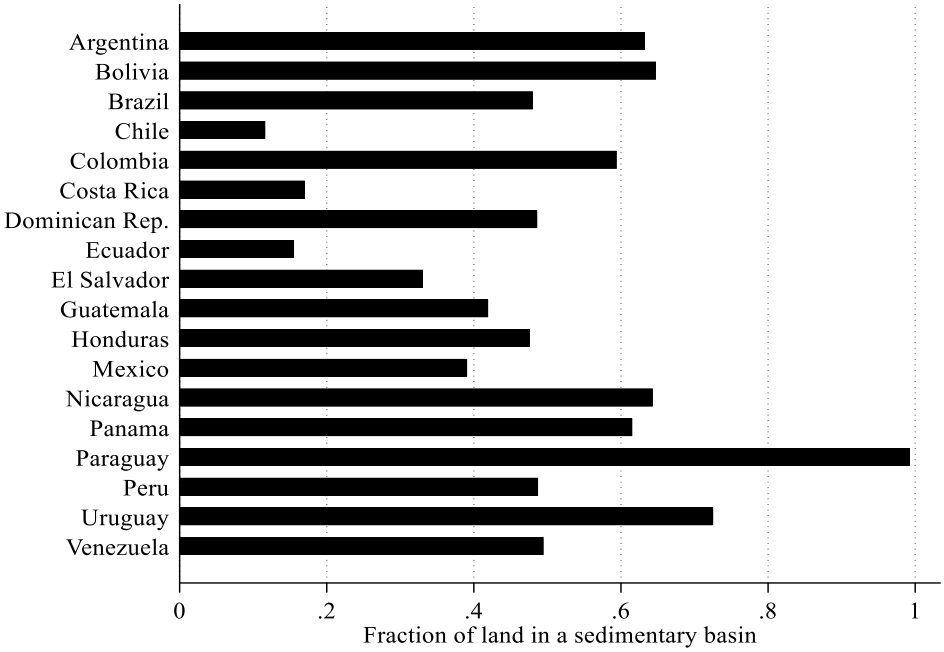
Beyond looking at individuals' expectations, this study also aims to provide some empirical insights into the potential relationship between the extractive sector and respondents' reported life satisfaction. This builds on recent findings by Ali et al. (2020) and Mignamissi and Kuete (2021) that the sector may have a detrimental effect on citizens' satisfaction, as well as Toews' (2015) exposition on the link between minerals, citizens' aspirations, and their degree of satisfaction. The outcome variable here derives from a survey question in the Latinobarómetro asking whether respondents are satisfied with their life (**Life Sat.**). Scaled from 1 to 4, the original ordering of respondents' responses is again reversed so that larger values indicate a higher degree of life satisfaction. The values 1, 2, 3, and 4, indicate that they are 'not satisfied at all', 'not very satisfied', 'fairly satisfied', and 'very satisfied' with their life.

The econometric specification used in this study involves regressing measures of individual expectations on the interaction between a measure of a country's mineral rents and a measure of its land in sedimentary basins. This study uses data from Cassidy (2019) on the fraction of each country's land that resides in a sedimentary basin (**Basin**).[14] Figure 2 presents information on each country's sedimentary endowment. This study interacts each country's sedimentary basin endowment with data from the World Development Indicator database on their mineral rent

[14] Note this analysis does not use the precise sedimentary basin variable reported in Cassidy (2019); which is the log of the sovereign area (in square kilometers) per 1,000 inhabitants. Population size may be endogenously determined and existing discussions (such as those in Bellemare et al. 2017) have explained at some length why lagged explanatory variables should not be used to 'exogenise' variables for identification purposes. Alternatively, using absolute values (i.e. not per capita values) will overvalue the relative endowments of larger countries. Given that the estimation strategy is dependent on the exogeneity of the basin variable, we prefer the fraction variable presented in an earlier version of Cassidy's results (which is conditionally exogenous and impartial to a country's size). One further point might be added to this, even if we were to use the population based variable equivalent to Cassidy's (2019) definition, the results would indicate there is not a statistically significant relationship between the sedimentary basin and mineral rents interaction term (discussed in the estimation strategy) and any of the three outcome variables. Hence it is thought in this instance that the fraction variable may also best capture the relationship we wish to explore. The fraction variable used here is available in Cassidy's (2019) dataset published online.

dependency (measured as the sum of the fraction of mineral, coal, oil and natural gas rents in GDP) (**MR Dependence**). The interacted value between these two variables is multiplied by 100 to prevent the coefficient from appearing misleadingly large in the regression models reported below. For comparative purposes, further specifications also consider interacting the sedimentary basin variable with a dependence variable focused specifically on oil rents (reflecting the approach taken by Cassidy, 2019 and Mahdavi et al., 2020 to instrument oil wealth with sedimentary basins).

Figure 2. Graph on each country's land in a sedimentary basin



Data Source: Cassidy (2019) supplementary data file.

Since the seminal work by Brunnschweiler and Bulte (2008), it has become customary also to distinguish between measures of mineral dependence and mineral abundance. The latter uses the log value of mineral rents per capita as a measure. Numerous studies have found that mineral dependence relates more strongly with resource curse phenomena because it captures the importance of the extractive sector relative to other economic activities. In principle, mineral-abundant economies can reduce their mineral dependence by diversifying their economies (as in the case of

Norway) (Papyrakis et al., 2017). This indicates that, in diversified economies, the extractive sector may not receive the same level of public interest or hold the same degree of political clout required to cause the expected interaction effect; this may weaken the relationship between mineral abundance and the outcome variables. To do justice to this stream of the literature, this study explores this using an interaction term between sedimentary basins and a measure of mineral abundance (mineral rents per capita). The data on mineral rents per capita derives from the World Development Indicator database (multiplying real GDP per capita by the fraction of mineral rents in GDP) (**MR per capita**).[15]

This study also includes data on several control variables determining respondents' reported outcomes. The control variables include the respondent's age, education, gender, civil-status, and socioeconomic status. The inclusion of these characteristics reflects the findings of similar studies that find, for example, that age corresponds with a more pessimistic economic outlook but that the change in pessimism decreases as people age (in other words, the coefficient for age is negative and the coefficient of age squared is positive). They also show that individuals with secondary and higher education report more optimistic expectations, as do also males and those with higher socioeconomic status. These factors, for example, may also relate with job prospects and social access to economic opportunities (Graham and Sukhtankar, 2004; Clark and D'Ambrosio, 2018).

Similarly, the literature on life satisfaction largely indicates that higher socioeconomic status, education, and marriage are positively associated with life satisfaction. It also indicates that age is negatively correlated with life satisfaction and that its squared term is positively correlated. The relationship between gender and life

[15] Note that here it is not necessary to multiply the value of the interaction term by 100.

satisfaction is rather complex and, in contrast to the literature on expectations, in the literature on life satisfaction, women have historically tended to report relatively more positive outcomes; this suggests they are generally more satisfied with their lives. However, the literature also shows that the relationship between gender and life satisfaction is mediated by several societal factors such as income disparities, gender discrimination, and other gendered social inequalities (Bjørnskov et al., 2008; Graham and Lora, 2009). Furthermore, numerous discussions indicate a continued decline in the state of female happiness globally, highlighting that data from the past couple of decades suggests women are no longer more likely to report greater life satisfaction than men. Rather, in many contexts, the opposite is more likely (e.g. Stevenson and Wolfers, 2009).

Finally, further country-level time-varying control variables are also included in the data for additional analysis. These variables are inspired by common macroeconomic variables appearing in the literature on satisfaction discussed in the introduction. The variables include the log of GDP per capita, GDP per capita growth (%), the unemployment rate (% of total labour force), trade openness (i.e. international trade % of GDP) and inflation (captured using the annual % GDP deflator). For basic intuition, we might notionally consider that generally higher levels of GDP, GDP growth and trade are positive economic factors for a country's economic outlook and security (thus potentially promoting life satisfaction) whereas unemployment and inflation are negative economic factors often causing insecurity and imposing higher costs on basic living. However, as mentioned previously, there is a great deal of debate and ambiguity about these variables' expected relationship with citizen expectations and life satisfaction. Again, all of the control variable statistics are presented in Table 2, and further descriptive details are available in Appendix B.1.

Estimation strategy

In this study, we examine an ordered logit regression model estimating the likelihood that individual i in year t reports expectation $\ell \{1, 2,\ldots,\mathscr{D}\}$.[16] Note that the description of this framework outlined below is sufficiently generalisable that we may also simply replace the expectations term with satisfaction when applicable. The regression model estimating the probability respondent i reports expectation ℓ takes the following form:

$$Pr(Expectation_{ijt}) = \beta_1 MR_{jt} + \beta_2 MR_{jt} * Basin_j + \beta_3 X_{ijt} + \tau_t + \lambda_j + \varepsilon_{ijt}$$

The variable MR denotes mineral rents in country j at time t and $Basin$ the endowment of land in a sedimentary basin in country j. The interaction term between the MR and $Basin$ variable is the term intended to identify the effects of the extractive sector on expectations. One might expect both components of the interaction term to appear in this model. However, the $Basin$ variable is time-invariant and is, therefore, captured by the model's fixed effects (discussed below). X is the vector of control variables.

The parameters β_1, β_2 and β_3 are the variables' coefficients, and the parameters τ_t and λ_j are the fixed components of the error term. τ_t captures year-specific aggregate factors correlated with the outcome variable. Meanwhile, λ_j captures the country-specific fixed effects. For instance, the country-specific fixed effects may capture innate and difficult-to-measure time-invariant factors. This includes countries' cultural and societal histories (which may affect individuals' psychological

[16] This estimation approach uses a maximum likelihood estimator, the details of which can be found in many common econometric texts (such as Wooldridge, 2012).

disposition or outlook), as well as other geological processes correlated with the formation of sedimentary basins. ε_{ijt} is the variable component of the error term.

In this regression, whereas the interaction term's coefficient (β_2) is consistent, the coefficient of the main term for the endogenous variable (MR) is inconsistent (i.e. β_1 is inconsistent) (e.g. Bun and Harrison, 2018). The inclusion of the endogenous variable in this model is necessary to ensure the consistency of β_2; however, the results inferred from the value of β_1 are erroneous.[17] Although this limits what we might infer about the magnitude of the full marginal effect of the extractive sector, as discussed above, this interaction effect provides an important indicator from which we may speculate about the direction of its overall effect. In this respect, this might also be considered a lower-bound estimate of the effects of the extractive sector's economic activity (i.e. where $\beta_1 = 0$). The interaction term in itself is also interesting here because it provides insights into the variation in outcomes caused by the extractive sector from the time-varying effects of prospective mineral endowments.

2.4 Results

We now examine the findings from this empirical analysis. First, Table 3 presents the results from the regressions on respondents' expectations concerning the future economic situation of their country. The first column in Table 3 reports a parsimonious specification including the mineral rent dependence variable; its interaction with the sedimentary basin variable; and exogenous control variables for age, the square of age divided by 100, and the binary male variable.

[17] Bun and Harrison (2018) provide expansive proofs of this condition for an OLS regression. The results here are robust to the use of both maximum likelihood (presented in text) and OLS estimators.

Table 3. Regressions on expectations concerning changes in the respondent's country's economic situation

	(1) Country Exp.	**(2)** Country Exp.	**(3)** Country Exp.	**(4)** Country Exp.
Min. Dep.*Basin	1.128***	1.128***	1.129***	1.126***
	(0.048)	(0.048)	(0.048)	(0.049)
Min. Dep.	0.133	0.133	0.136	0.145
	(0.181)	(0.180)	(0.189)	(0.208)
Age	0.966***	0.969***	0.969***	0.969***
	(0.003)	(0.003)	(0.003)	(0.003)
(Age ^ 2) / 100	1.030***	1.028***	1.028***	1.028***
	(0.003)	(0.003)	(0.003)	(0.003)
Gender (Male)	1.117***	1.114***	1.112***	1.112***
	(0.017)	(0.017)	(0.016)	(0.016)
Civil Status				
Single		1.053***	1.048***	1.046***
		(0.015)	(0.013)	(0.013)
Separated		0.990	0.990	0.997
		(0.013)	(0.013)	(0.013)
Education Level				
Secondary Education			1.077**	1.037
			(0.033)	(0.028)
Higher Education			1.073	0.992
			(0.057)	(0.044)
Socioeconomic Status				
Bad				1.070**
				(0.031)
Not bad				1.161***
				(0.055)
Good				1.266***
				(0.069)
Very Good				1.419***
				(0.066)
Observations	252,568	251,142	251,116	251,111
No. of Countries	18	18	18	18
Country fixed-effects	Yes	Yes	Yes	Yes
Year fixed-effects	Yes	Yes	Yes	Yes

Notes: Coefficients report estimated odds ratio. Country cluster-robust standard errors are in parentheses. Superscripts *, **, *** correspond with a 10, 5 and 1% level of significance. Coefficients for the year and country fixed effects are omitted for brevity.

The models reported in Columns 2, 3 and 4 in Table 3 build on this, providing richer specifications that add the control variables for respondents' civil status, education level, and socioeconomic status. Although they provide intuitive results to compare with the parsimonious specification, it is important to note that these richer specifications should be interpreted with caution because the additional control variables are not necessarily exogenous; the inclusion of endogenous control variables may bias the coefficient of the interaction term between the mineral rent and sedimentary basin variable. The coefficients reported in the table refer to the estimated odds ratio (OR), where a coefficient value greater than 1 indicates an increase in the relative likelihood of respondents reporting more optimistic expectations, and a value less than 1 indicates that the likelihood decreases.

Overall, the results in Table 3 consistently show that the estimated coefficient for the interaction term between the mineral dependence and sedimentary basin variables is both statistically significant and greater than 1. This indicates that a positive relationship exists between the interaction term and respondents' expectations concerning the future economic situation of their country. The significant interaction effect estimated in Column 1 (OR = 1.128) indicates that a 1-unit increase in the interaction term increases the odds of respondents reporting a more optimistic outlook by approximately 12.8%. The magnitude of the coefficients from the models using the richer specifications reported in Columns 2 to 4 are largely similar.

Considering the magnitude of these coefficients further, conventional benchmarks established by Cohen (1988) suggest that ORs above 1.437, 2.476 and 4.27 might constitute small, medium and large effects, respectively.[18] However, these

[18] Cohen (1988) established benchmarks of 0.2, 0.5, and 0.8 standard deviations as small, medium, and large size effects. Equivalent values for odds ratios are reported using formulas from Borenstein et al. (2009).

benchmarks were based only on intuitive examples from the biological world (using predominantly visible differences in the body heights of men and women). Cohen (1988) warns that such benchmarks may not apply to all fields and that there exists a severe risk of their overuse. Some ambiguity also exists as to whether these values should be minimum cut-offs or may even be centroids. More recent research examining effects observed in applied psychology and the social sciences shows that more reasonable benchmarks could be less than half of those previously approximated by Cohen (1988) in standard deviations (e.g. Hill et al., 2008; Bosco et al., 2015). Half of the small, medium and large effects reported above in terms of OR equivalents is 1.199, 1.5737 and 2.066. Even by these yardsticks, however, the magnitude of the interaction term's ORs nonetheless appear reasonably small.

Nevertheless, it is important to consider two further points when interpreting the magnitude of these coefficients. First, the full effects of mineral rents may be larger because this estimate only be considered only a lower-bound estimate of the magnitude of the extractive sector's effects on expectations. Second, a 1-unit increase in the interaction term is not very large; the difference between the smallest and largest value is more than 15 units (see Table 2). The coefficient reported in Column 1 of Table 3 indicates that a 15-unit increase in the value of the interaction term corresponds with an OR of approximately 6.545.[19] It is also not uncommon to see even annual changes in mineral rent dependency that cause changes greater than 1 in the interaction term's value. For example, during the commodity market's recovery from the global financial crisis, Venezuela witnessed a 5.675 point increase in the interaction term's value. This was due to an approximately 11.5 percentage point increase in its level of mineral

[19] To estimate the interaction terms OR for changes of different magnitudes, start by calculating the coefficients estimate in terms of log odds. The log odds model has the convenient property of being linear. Here log odds = ln(odds ratio). Next, we multiply the value of the change interaction term by the log odds coefficient estimate. We and then convert back to an odds ratio ($e^{\log odds}$ = odds ratio).

dependence. Simulating an increase of this magnitude corresponds with an OR of 1.981, which implies that respondents are almost twice as likely to report a more optimistic expectation. Considered together, these arguments suggest that the magnitude of the extractive sector's influence on ordinary citizens' outlook about their country's future economic prospects may indeed be significant.

Before moving on, we briefly inspect the estimated effects of some of the other control variables in Table 3. The results show that respondents become increasingly more likely to report a more pessimistic outlook about their country's economic situation as they age (coefficients significantly smaller than 1).[20] The coefficient of the quadratic (age) term is significant and above 1. In line with previous evidence, this indicates that the negative change occurs at a decreasing rate (e.g. Clark and D'Ambrosio, 2018). On average, males are also significantly more likely to report a more optimistic outlook than females, as are respondents who are single rather than married. The findings that males are more optimistic than females in this sample is not particularly surprising; it may indicate that the societies being examined here have been historically very gendered and continue to lag behind many other parts of the world in this respect, such as Europe and North America.[21] We also see that respondents who belong to a more privileged socioeconomic group are significantly more likely to report higher expectations. Education levels, meanwhile, appear to have only a very small positive effect on expectations (if they are significant).

[20] To compare the magnitude of coefficients that are less than 1 to those that are greater than 1 we may simply take their reciprocal values (i.e. divide 1 by the reported odds ratio). E.g. the reciprocal value of the age coefficient (0.966) is 1.035.
[21] E.g. see the World Economic Forum's Global Gender Gap Report. Available here: http://www3.weforum.org/docs/WEF_GGGR_2020.pdf

Table 4. Regressions on expectations concerning changes in respondent's personal economic situation

	(1) Personal Exp.	**(2)** Personal Exp.	**(3)** Personal Exp.	**(4)** Personal Exp.
Min. Dep.*Basin	1.090**	1.089**	1.090**	1.086**
	(0.039)	(0.039)	(0.040)	(0.043)
Min. Dep.	0.462	0.475	0.511	0.572
	(0.682)	(0.699)	(0.824)	(0.988)
Age	0.967***	0.967***	0.968***	0.968***
	(0.003)	(0.003)	(0.003)	(0.003)
(Age ^ 2) / 100	1.018***	1.019***	1.019***	1.019***
	(0.003)	(0.002)	(0.002)	(0.002)
Gender (Male)	1.037**	1.032*	1.028*	1.027*
	(0.018)	(0.018)	(0.017)	(0.016)
Civil Status				
Single		1.007	0.992	0.988
		(0.019)	(0.017)	(0.016)
Separated		0.966**	0.966**	0.978
		(0.015)	(0.015)	(0.015)
Education Level				
Secondary Education			1.194***	1.121***
			(0.043)	(0.035)
Higher Education			1.268***	1.120**
			(0.072)	(0.050)
Socioeconomic Status				
Bad				1.202***
				(0.032)
Not bad				1.400***
				(0.041)
Good				1.602***
				(0.051)
Very Good				1.828***
				(0.097)
Observations	272,497	271,026	270,998	270,993
No. of Countries	18	18	18	18
Country fixed-effects	Yes	Yes	Yes	Yes
Year fixed-effects	Yes	Yes	Yes	Yes

Notes: Coefficients report estimated odds ratio. Country cluster-robust standard errors are in parentheses. Superscripts *, **, *** correspond with a 10, 5 and 1% level of significance. Coefficients for the year and country fixed effects are omitted for brevity.

Next, Table 4 reports the results from the regressions on respondents' expectations concerning their personal economic situation. The estimated coefficient of the interaction term between the mineral dependence and sedimentary basin variable is, again, both statistically significant and greater than 1. The coefficients of the other variables in Table 4 are also largely in line with the results of the previous regressions on respondents' expectations about the country's economic situation. Again, ageing relates with a greater likelihood of reporting a more pessimistic outlook (however, the rate of change declines with age, as indicated by the quadratic term). Males are also significantly more likely to be optimistic about changes in their personal economic situation, as are those from a higher socioeconomic group. In this instance, however, secondary and higher education is a significant determinant of expectations. The coefficients indicate that respondents with secondary and higher education are likely to be more optimistic about changes in their future economic situation. Respondents who are separated are also less likely than married respondents to report a more optimistic outlook.

The results in Table 4 show that the interaction term between the mineral dependence and sedimentary basin variable is positively related to respondents' expectations concerning their personal economic situation. As might be expected, compared to the coefficients in the regressions on expectations concerning changes in the respondent's country's economic situation (Table 3), the interaction term's coefficients are slightly more conservative. This becomes more apparent when examining the results of the intuitive simulation discussed above (based on Venezuela's empirical experience). The interaction term's coefficient (1.090) from Column 1 in Table 4 infers that, given a 5.675-point increase in the value of the interaction term, the estimated OR is 1.631. Compared to the OR (1.981) simulated

from the results in Table 3, this does appear smaller. However, given the coefficients' standard errors, the difference in the magnitude of these coefficients is not significant.

Table 5. Regressions on respondents reported life satisfaction

	(1) Life Sat.	**(2)** Life Sat.	**(3)** Life Sat.	**(4)** Life Sat.
Min. Dep.*Basin	1.044	1.044	1.043*	1.035
	(0.029)	(0.029)	(0.023)	(0.023)
Min. Dep.	0.504	0.490	0.614	0.806
	(0.617)	(0.604)	(0.585)	(0.710)
Age	0.965***	0.963***	0.963***	0.962***
	(0.003)	(0.003)	(0.003)	(0.003)
(Age ^ 2) / 100	1.032***	1.036***	1.038***	1.038***
	(0.003)	(0.004)	(0.004)	(0.004)
Gender (Male)	1.059***	1.042***	1.035**	1.033**
	(0.017)	(0.016)	(0.015)	(0.016)
Civil Status				
Single		0.969	0.934***	0.927***
		(0.022)	(0.021)	(0.019)
Separated		0.800***	0.797***	0.814***
		(0.021)	(0.021)	(0.019)
Education Level				
Secondary Education			1.261***	1.116***
			(0.037)	(0.029)
Higher Education			1.709***	1.337***
			(0.102)	(0.063)
Socioeconomic Status				
Bad				1.240***
				(0.050)
Not bad				1.632***
				(0.104)
Good				2.189***
				(0.178)
Very Good				2.930***
				(0.265)
Observations	273,583	272,156	272,125	272,120
No. of Countries	18	18	18	18
Country fixed-effects	Yes	Yes	Yes	Yes
Year fixed-effects	Yes	Yes	Yes	Yes

Notes: Coefficients report estimated odds ratio. Country cluster-robust standard errors are in parentheses. Superscripts *, **, *** correspond with a 10, 5 and 1% level of significance. Coefficients for the year and country fixed effects are omitted for brevity.

Table 5 shows the results of the regressions on respondents' life satisfaction. It provides limited evidence in support of a relationship between life satisfaction and the extractive sector's activity. The coefficients are consistently small across the various specifications presented and, except for Column 3, they are all insignificant. However, the discussion above has also clearly outlined that this study provides conservative (lower-bound) estimates of the true effects of the extractive sector. This means it may also be susceptible to type II errors (i.e. concluding that there is no significant effect when one in fact exists) where the strength of the relationship is modest.

The regressions presented so far interact a measure of mineral dependence (the proportion of the total value of mineral rents in GDP) with the sedimentary basin variable. Table 6 reports the regressions, replicating the analysis with an interaction between the log value of mineral income per capita (i.e. mineral abundance) and the sedimentary basin variable. For brevity, we present the results of the preferred parsimonious specifications without the potentially endogenous control variables. The interaction term's coefficient is statistically insignificant across the various specifications using the different outcome variables in Table 6. The results provide the same qualitative conclusions even when the additional control variables are included in the regression model. These findings are in line with previous evidence on the resource curse, which finds that mineral abundance is not correlated with societal outcomes per se (e.g. Brunnschweiler and Bulte, 2008). They also correspond with the expectation that in diversified economies, the extractive sector may not exercise the same public and political leverage provoking significant attention to its economic interests in sedimentary basins.

Table 6. Regressions using the log of mineral rents per capita measure

	(1) Country Exp.	**(2)** Personal Exp.	**(3)** Life Sat.
Min. per capita*Basin	1.282	0.968	1.115
	(0.258)	(0.243)	(0.189)
Min. per capita	1.084	1.259	1.040
	(0.148)	(0.199)	(0.132)
Age	0.967***	0.967***	0.966***
	(0.003)	(0.003)	(0.003)
(Age ^ 2) / 100	1.030***	1.018***	1.032***
	(0.003)	(0.003)	(0.003)
Gender (Male)	1.118***	1.037**	1.058***
	(0.017)	(0.018)	(0.017)
Observations	252,568	272,497	273,583
No. of Countries	18	18	18
Country fixed-effects	Yes	Yes	Yes
Year fixed-effects	Yes	Yes	Yes

Notes: Coefficients report estimated odds ratio. Country cluster-robust standard errors are in parentheses. Superscripts *, **, *** correspond with a 10, 5 and 1% level of significance. Coefficients for the year and country fixed effects are omitted for brevity.

Furthermore, this analysis also looked at the results of using interaction terms featuring oil dependence and oil abundance variables (see Appendix B.2 and B.3). The results of the exercise did not qualitatively change the conclusions of the main analysis. Perhaps the only notable difference is that the magnitude of the difference between the interaction terms' coefficients for regressions on respondents' expectations concerning changes in the economic situation of their country and their own economic situation is slightly larger. This may also reflect the fact that petroleum often tends to be more geographically concentrated than other minerals (which makes its accrued rents more easily controlled and appropriable) as well as that the high oil prices seen throughout much of the study period increased the incentive to rent-seek (Papyrakis et al., 2017).

Another exercise replicated the main analysis having excluded observations from countries with rather small extractive sectors. The restricted sample excluded observations from El Salvador, Paraguay, Panama and Honduras. These countries earned very little income from extractive industries during the study period (below USD 100 per annum per capita). The results are shown in Appendix B.4 and B.5 – and, again, the conclusions of the exercise are qualitatively in line with the main results presented above. Other specifications also experimented with adding several additional country-level control variables to the regressions, including logged GDP per capita, % GDP growth, trade openness, unemployment and inflation. Appendix B.6 and B.7 present some of these results. It is again important to note that these richer specifications should be interpreted with caution as these additional control variables are not necessarily exogenous. Nevertheless, the conclusions concerning the interaction term are approximately the same as our main results, although the size of the significant coefficients shrinks slightly.

Finally, this analysis uses individual survey data. Another common approach uses aggregated (averaged) country-level outcome data (e.g. Ali et al., 2020; Mignamissi and Kuete, 2021). This is common where the survey data is not easily accessible from its source or when access is restricted but country summary information is presented by survey firms. Although aggregate-level data is often more readily available than individual-level survey data, various studies show that statistical estimates based on aggregate data should be approached with caution (e.g. Zee Ma and Zhang, 2014).[22] Nevertheless, for purposes of comparison, Appendix B.8 presents a summary of the main results using a country-year fixed-effects regression after having

[22] Woodhouse and Goldstein (1988) and Aitkin and Longford (1986) provide 'the classic' demonstration of these issues using school examination results, showing an analysis of aggregated data produce markedly different results from regressions using the individual data.

averaged and logged the survey responses for each country and year. In this instance, the sign and significance of the coefficients of the interaction term between the mineral rent and sedimentary basin variables remain largely the same as those presented in the main analysis above on the individual-level data.

2.5 Conclusion

In recent years, the growth of the extractive-based development imperative within Latin America has led scholars to speculate about the possible effects this may have on citizens' expectations and, in turn, their life satisfaction. This study examines this relationship using public opinion data collected between 2001 and 2017 from 18 countries in Latin America. From the variation determined by the interaction between the sedimentary basin and mineral rent dependence variables, this study's results indicate that a 'euphoric' relationship does exist between the extractive sector and expectations. The results also show that this relationship is not trivial, either, particularly given larger episodes of changes in extractive activity and mineral dependence. For example, our simulations show that an 11.5 percentage-point increase in Venezuela's mineral rent dependence (which is equivalent to the annual increase observed during the oil market's recovery from the global financial crisis) would almost double the likelihood of respondents reporting more optimistic expectations about changes in their country's economic situation. It would also increase the probability of reporting more optimistic expectations about changes in their own economic situation by approximately 63%.

Some suggest that citizens may feel that they do not directly benefit from mineral extraction and that its benefits may be concentrated in the broader economy. Looking at the difference in the estimated effects for the different types of expectations

examined, this study's results indicate that expectations about changes in the country's economic situation are more sensitive to increases in the interaction term's value than are expectations about citizens' personal economic situation. However, because the differences are not statistically significant, we cannot confidently corroborate this hypothesis.

Finally, this study does not detect a corresponding significant relationship between minerals and citizens' life satisfaction as hypothesised by either Toews (2015) or the broader literature on the happiness resource curse. However, this study poses only an initial line of enquiry into these issues, and further research is needed to better understand these relationships. A potential limitation of the estimation strategy is that the analysis may provide only lower-bound estimates of the effects of the sector. Furthermore, future research should consider that this analysis examines only relatively short-term expectations. Understanding whether the relationship with long-term expectations differs would pose an interesting extension, as too would examining the relationship with aspirations (for which we do not have data in this instance).

Chapter 3.

An assessment of the Extractive Industries Transparency Initiative (EITI) using the Bayesian Corruption Indicator

Advocated across the international community for more than 15 years, the Extractive Industries Transparency Initiative (EITI) is now widely recognised as a hallmark anti-corruption scheme in the extractive sector. This study presents an assessment of the relationship between EITI membership and countries' progress in tackling corruption. It is the first study to examine this issue using a 'state-of-the-art' indicator called the Bayesian Corruption Indicator (BCI). It also introduces an innovative estimation strategy combining entropy balancing with a difference-in-difference framework to address the baseline inequalities that exist between member and non-member countries. Contrary to the findings of many leading studies, this analysis finds that corruption scores have improved significantly among EITI member countries. In particular, the evidence is strongest when we examine a sub-group of EITI members designated as being fully compliant with the initiative's transparency standards.

Keywords: Corruption; EITI; Extractive Industries; Transparency

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3.1 Introduction

Advocated across the international community for more than 15 years, the Extractive Industries Transparency Initiative (EITI) has become widely recognised as a hallmark anti-corruption scheme in the extractive sector. The Organization for Economic Co-operation and Development (OECD) identifies the extractive industries as the world's most corrupt economic sector, and it is the intent of the EITI to help to alleviate the sectors' corruption problems by unveiling financial and contractual discrepancies in public agreements and enhancing public accountability (Rustad et al., 2017 and Van Alstine, 2017).[23] In practice, the EITI requires its member countries to abide by financial and contractual disclosure standards and to maintain a public feedback mechanism in the form of a national multi-stakeholder group comprising private, public, and civil society representatives.[24] The EITI also uses audits to verify members' compliance with its disclosure standards and to ensure that these requirements are upheld (Sovacool et al., 2016).[25]

Fifty-five countries are currently publicly committed to implementing the EITI's standards, and the initiative has contributed to the disclosure of more than USD 3 trillion of public revenues from the extractive industries worldwide (EITI, 2020). Some suggest that these commitments may have helped members to attract foreign aid and investment (Lujala, 2018). However, discontent has grown among many in the sector as questions have continued to arise about the EITI's ability to induce meaningful changes among its members. While some critics point towards issues

[23] See OECD Foreign Bribery Report: An Analysis of the Crime of Bribery of Foreign Public Officials. Available online: https://www.oecd.org/corruption/oecd-foreign-bribery-report-9789264226616-en.htm

[24] Details of the various disclosure requirements are provided here: https://eiti.org/document/standard

[25] Following validation of their compliance, countries are required to re-validate their compliance periodically, at least every 3 years. Further details of the joining and verification process are available here: https://eiti.org/join-EITI.

concerning the EITI's implementation (such as members' incomplete and insufficient reporting of information) (Öge, 2016), a review by Rustad et al. (2017) adds to the growing disillusionment surrounding the initiative; the review identifies a broad range of studies offering mixed conclusions as to whether a relationship exists between EITI membership and countries' progress in tackling corruption.

Bickham (2009) argues that the ultimate test of the EITI must be whether it has stimulated the systemic effects expected at its inception and whether this has contributed to improvements in EITI countries' levels of corruption. Nonetheless, little attention has been paid to the methodologies applied in this literature to measure countries' progress. In particular, these studies often examine changes in corruption indicators (such as the World Governance Indicators Control of Corruption Index) that are more indicative than consistent in their measurement of corruption over time. Such issues may confound the results of existing studies because the corruption scores in one year are not necessarily comparable to those in the next year. Also, studies that draw comparisons between countries' outcomes often neglect the endogeneity issues caused by countries' self-selection into the initiative.

Reflecting on these limitations, this study provides a re-assessment of the relationship between the EITI and countries' progress in tackling corruption using a state-of-the-art indicator called the Bayesian Corruption Indicator (BCI). Compared to other common corruption indicators, this measure benefits from characteristics such as improved comparability over time and reduced demands to impute data during its construction. Meanwhile, to address the endogeneity issues caused by self-selection, this study combines an entropy balancing approach with a difference-in-difference framework. This approach compares changes in EITI members corruption scores to an adjusted (weighted) control group of non-EITI countries. The weights are

created such that they minimise the difference in baseline characteristics between members and non-member countries. The approach draws on research showing that minimising the baseline differences between compared samples may significantly decrease an observational estimator's bias (Glazerman et al., 2003; Jaciw, 2016).

Contrary to the findings of many leading studies, this study shows that corruption scores among EITI member countries have improved significantly relative to non-member countries after adjusting for the differences in their baseline characteristics. In particular, this evidence is strongest among countries considered compliant with the initiative's international standards. The results of this cross-country assessment of the EITI offers important insights into suggestive empirical regularities concerning changes in corruption outcomes across the globe. Although a degree of cynicism (or at least scepticism) has built up in recent years around the EITI, this study paints a more optimistic picture of the progress made by its members. Nevertheless, even though its members do appear to be making promising progress, it is clear that even the initiative's most ardent supporters would not claim it is a silver bullet. Critics raise important issues about the implementation of the EITI, and recent changes to the EITI's standards (for example, increasing the scope of its standards and its compliance verification process) have only just begun to address them.

This chapter continues in Section 3.2 with a more in-depth review summarising the key theories, debates, and empirical evidence concerning the EITI and corruption. Section 3 then provides details of this study's methodology. This includes a description of the data and estimation strategy it uses. Section 3.4 presents the results of the analysis. Finally, Section 3.5 further discusses the study's findings and provides the study's concluding remarks concerning policy and future research.

3.2 The EITI and Corruption: Literature Review

The EITI has become a widely recognised policy instrument to help combat corruption in the extractives sector. However, since its inception, its implementation has also been controversial and subject to a polarised debate. This section provides a brief overview of some of the key arguments underlying the debates concerning the EITI. It starts with a summary of policy arguments underpinning the EITI's inception and then describes some of the key criticisms the initiative has faced through its implementation. Following this, it examines some of the existing empirical evidence on the relationship between the EITI and corruption.

Shining a light on corruption: Arguments underpinning the EITI

The policy arguments underlying the EITI's creation generally portray the initiative as a multi-pronged and complex intervention. The EITI is not thought of as subscribing to one single channel or mechanism delivering change in the extractive industries. Rather, its approach considers that tackling corruption may require systematic changes supported by several simultaneous mechanisms combining transparency, deliberation, demand/capacity-building, and support for the policy environment. However, the first of these mechanisms (i.e. concerning information and transparency) has most clearly defined the growth of the EITI as an anti-corruption policy. Here it is conceived that increased disclosure in the extractives sector will better facilitate the identification of corrupt activity. This relates to the idea that transparency may help to detect and reduce public malfeasance through its 'sunshine effect' (Wilson, 2014). An example of this is described by McDevitt (2017), who highlights that company and government reporting to the EITI uncovered nearly USD 10 billion of missing tax and royalty payments in Nigeria.

The second route through which it is thought the initiative may help to tackle corruption is through its effect on accountability and deliberation in the extractives sector. The EITI's proponents argue that the initiative dilutes information asymmetry and may thereby help empower citizens to hold public officials accountable for the incidence of financial discrepancies (Van Alstine, 2017). This may also help to alter the balance of incentives (i.e. it may increase the risks) associated with officials using their position for private gain. Although some suggest that this improved accountability may prevent illicit acts of corruption or embezzlement from occurring in the first place (Gillies and Heuty, 2011), it is also thought that the EITI's multi-stakeholder groups provide another way through which the initiative can contribute to improving accountability. These groups intend to create a legitimate space for civil society to participate in the management of the extractive sector.

A third way the EITI may contribute to helping build stronger institutions and combatting corruption is through its capacity-building role. For example, more than 1000 targeted participants from multi-stakeholder groups, national secretariats, government, civil society, industry, parliament, state-owned enterprises and national audit institutions participated in EITI peer learning and capacity building schemes in 2016 alone (EITI, 2020). This is function is considered important for developing an understanding of the information created by the EITI and to stimulate demand for better practices for managing extractive activity.

Building on this point, Bickham (2015) describes the predicted 'viral' (or systemic) effects the EITI may have on the broader governance of natural resources. This considers that the initiative may act as an 'entry point' or stimulant for broader reforms (Fenton Villar, 2021c). Bebbington et al. (2017) offer similar insights highlighting the influence of the initiative on the policy environment. They find that

the politics concerning transparency in the extractive sector has been more stable and less susceptible to political U-turns due to changes in the national political landscape among EITI members. Numerous examples also exist indicating the noticeable spill-over effects the EITI has had on its members' legislative and governing environments. For instance, Reinfeldt (2018) highlights some of the EITI's achievements supporting broader economic and institutional reforms helping to combat corruption in Ukraine.

Is the EITI sufficient?

However, despite its relatively widespread adoption, the EITI has not escaped criticism. Invoking theories of 'mock compliance', critics often argue the EITI enables governments to appease the international community by mimicking compliance with global norms without inducing meaningful changes (Öge, 2016). This may also reflect countries' historically slow progression to achieving compliance. Lujala (2018) reports it has taken countries, on average, 17 months to become formal candidates (i.e. to join the formal process of applying to join the initiative) after making a public commitment to implement the EITI's transparency standards, and a further four years to advance their implementation to fully comply with them. Here it is suggested that some countries may intend to remain merely associated with the EITI without inducing the desired changes. This is an issue that, in part, motivated major updates to the EITI compliance validation system in 2016. This included introducing a more disaggregated validation system with specific timeframes that members must adhere to. Failure to comply with these timeframes can result in a country becoming delisted (or expelled) from the initiative.

Furthermore, the Institute for Multi-Stakeholder Initiative Integrity has criticised the EITI because governments are allowed to select the members that

constitute the national multi-stakeholder group. This freedom may enable governments to simply appoint favourable representatives to this group and circumvent the initiative's intended accountability mechanism.[26] Maconachie et al. (2015) further argue that even where meaningful representation exists, it may not be reasonable to consider that civil society's inclusion in decision making is meaningful. For example, in some cases, civil society representatives have been invited to stakeholder meetings too late to be able to influence the agenda of those meetings. Also, although many governments appear willing to partially increase their levels of disclosure, recommendations from the initiative's audits have not necessarily materialised in action, despite serious irregularities being noted in some instances. This relates to critics' warnings about the initiatives limited legal mandate in many implementing countries (Kasekende et al., 2016).

Further concerns are also voiced about the shortcomings of the EITI's relatively limited focus or scope (Kolstad and Wiig, 2009 and Vadlamannati and Soysa, 2016). The initiative's disclosure standards historically focused very narrowly on the resource revenues received by governments and not on the deployment (or expenditure) of revenues or other contractual factors. Reflecting on this issue, the EITI has continued to modify and expand its standards. For example, updates have expanded the EITI's standards remit since 2016 to include issues such as the disclosure of the distribution of revenues, environmental payments, and beneficial ownership information. Nevertheless, despite the widened remit of its disclosure standards, the appeal of the initiative to ordinary citizens remains a contentious issue. McDevitt (2017) describes that the technical nature of the disclosed information may render it incomprehensible

[26] E.g. see the comments from the Institute for Multi-Stakeholder Initiative Integrity on the EITI at http://www.msi-integrity.org/assessing-eiti-msg-governance/

to the public. This also explains the growing concerns that the EITI is failing to engage with and empower local populations.

The EITI and corruption: Existing evidence

From the arguments summarised above, it is clear that some scholars emphasise the potential positive aspects of EITI membership while others remain more sceptical. A review of existing evidence shows that the empirical literature on the EITI and corruption also offers no clear indication of the progress made in tackling corruption among EITI members. Evidence provides mixed conclusions about the direction and significance of changes to corruption outcomes (Rustad et al., 2017). However, limited discussion exists about the various approaches adopted to examine this complex intervention. This is particularly important in this context given that many existing studies offer new and competing evidence based on methodological debates.

For instance, studies using time-series-based approaches have rarely offered positive conclusions concerning the effects of the EITI (e.g. Öge, 2016). These approaches often examine graphical trends in corruption outcomes or use a single-group interrupted time-series analysis. However, both methods impose stringent assumptions about changes in corruption scores in the absence of the EITI. They assume that corruption scores would not have changed, had members not joined the initiative, or that they would change at a linear rate (a rate often inferred from as few as one or two years of outcome data).

Furthermore, like other research discussed in this review, these time-series studies also use common corruption indicators, such as the World Governance Indicators Control of Corruption Index (CCI) and Transparency International's

Corruption Perceptions Index (CPI). It is well known that such measures often lack a degree of comparability over time. For example, the World Bank cautions against comparing the CCI's scores across different years because the scale changes annually,[27] which may confound any inferences drawn from an analysis that does so. Öge (2016) maintains that in the absence of alternative indicators, such indicators remain insightful. Nevertheless, this point highlights a broader underlying limitation apparent in this evidence.

Some evidence also exists that was obtained using a counterfactual-based approach (i.e. using a control group of non-EITI countries to determine changes in corruption outcomes that would occur in the absence of the EITI). For example, Ölcer (2009) compares EITI members' CCI scores for 2007 to non-EITI countries' scores. According to his analysis, perceptions indicate that the incidence of corruption is, on average, higher in EITI countries compared to non-EITI countries. However, Pitlik et al., (2010) and Lujala (2018) highlight that countries' decision to join the initiative is not random. This raises concerns of an endogeneity problem caused by selection bias (i.e. this is effectively like comparing apples with oranges). One method used to address this issue of selection bias includes controlling for variables correlated with countries' EITI membership in a regression specification (see Papyrakis et al., 2017). Nevertheless, a discussion by Kasekende et al. (2016) emphasises that this approach remains biased if unobserved variables jointly determine both the outcome variable (i.e. corruption) and the selection process (i.e. the decision to join and progress with EITI).

[27] This also reflects that the parameters underlying the model creating the indicators common units are re-estimated each year with different sources provided different parameters. The common units enable cross-country comparisons when countries do not appear in overlapping sources of data informing the indicator (see Standaert (2015) for further information).

To purge any potential confounding correlation between these factors, Kasekende et al. (2016) adopted a two-stage treatment effects model to analyse the effects of the EITI. However, numerous practical limitations also exist in this application. For example, the year in which countries joined the EITI varies. Although their study attempts to estimate the likelihood of a country joining the EITI over time, the two-step econometric estimator they employ does not allow variables to simultaneously determine the outcome variable and EITI membership status. This represents a problem because the reasons why a country may join the EITI (e.g. to improve aid commitments or FDI) may also be factors that are enhanced by EITI membership (Lujala, 2018). They circumvent this issue by including lagged values (from before the inception of the EITI) for a selection of variables. Beyond the subjectivity of some of their decision to lag (or not lag) specific variables, this also risks introducing a dynamic form of panel bias to this estimator design for static econometric models (as the authors also note).[28]

Other strategies for dealing with this problem include using a synthetic control method (SCM). At an individual country level, Fenton Villar and Papyrakis (2017) show perceptions of corruption improved in Zambia following its commitment to the EITI. López-Cazar et al. (2021) further replicated Fenton Villar and Papyrakis' (2017) SCM approach showing that, although corruption scores did not improve in Colombia, Guatemala, Honduras or Peru following their commitment to the EITI, they did improve marginally in Trinidad and Tobago. However, a broader challenge of the SCM approach exists in creating well-behaved synthetic comparisons for each member of the EITI to replicate the analysis across the globe.

[28] E.g. Kasekende et al. (2016) choose not to lag the GDP per capita variable. However, other analysts argue a plausible relationship exists between the EITI and GDP (see Corrigan 2014).

Alternatively, Sovacool et al. (2016) introduced an approach that defines a group of EITI countries that joined the initiative any time before 2014 and a 'control group' that did not join the EITI before this date. Measuring corruption using the CCI, the study then compares the average differences in changes in corruption scores between the EITI's inception in 2002 and 2014. Overall, they find that joining the EITI has not been associated with statistically significant changes in corruption. The key drawback of such a strategy is that it may provide a conservative estimate of the true effect of the EITI if the initiative's effects grow with time. This conservatism grows innately with the degree of late adopters in the defined group of EITI countries.[29]

3.3 Methodology

Reflecting on the existing limitations of studies in this existing literature, this study examines the progress made by EITI countries in improving corruption indicators using a contemporary indicator known as the Bayesian Corruption Indicator (BCI). Consistent with Sovacool et al. (2016), this study also creates a comparative analysis comparing changes in EITI members corruption scores to changes in non-EITI country scores. To address the endogeneity issues caused by self-selection, it also explores combining an entropy balancing approach with a difference-in-difference framework to minimise the difference in baseline characteristics between members and non-member countries. This section continues by describing the details of the variables and then provides further information on the estimation strategy.

[29] In other words, including countries with only limited histories with the EITI may dilute the estimated effect where the effect of the initiative increases with the maturity of its implementation. The effects in members with short histories may not have been given time to fully unfold and this explains why the effect estimate may also become a conservative or diluted estimate of the true effect. The greater the number of countries included in the EITI sample that consist of short EITI histories, the larger this problem becomes.

Data

In this study, we examine the relationship between the EITI and changes in countries' corruption outcomes using the BCI developed by Standaert (2015). The BCI is a composite index of the perceived overall level of public corruption. It combines information from 17 international surveys and 110 different survey questions covering perceptions of corruption. The values of the BCI variable range between 0 and 100 (with higher values given to countries perceived to have higher levels of corruption).

Due to insufficient quality data on the actual level of corruption, this corruption measure leans on well-established arguments positing that perceptions provide valuable insights into the incidence of corruption (Charron, 2016).[30] Of course, perceptions may still deviate to some degree from actual levels of corruption. However, perceptions of corruption are also important outcomes in their own right in this context. Perceptions are considered an important factor from a development perspective because they also directly matter for many outcomes (Kaufmann et al. 2006). For example, some highlight that citizens' perceptions of these issues have exacerbated local conflicts in many contexts and increased demand for consumption (Collier, 2017). Perception outcomes may also capture instances where societal improvements occur due to a reduction in misconceptions about corruption, which may have previously been prevalent due to the lack of clear information. This last point reflects many members' motivation to join the EITI. Zambia's public officials, for instance, expressed a desire to join the EITI to address misconceptions about

[30] The hidden nature of corruption, direct and comparable measures across countries are hard to come by or inherently flawed. Even if cases of corruption do become known, this might not occur for many years after the incident and the true details of the case (the magnitude of corruption or whether the incident even occurred) is often highly controversial. Since corruption usually leaves no paper trail, perceptions of corruption are sometimes the best, and the only, information we have (Kaufmann et al. 2006).

corruption and to restore public confidence in the government (Fenton Villar, 2020).[31] It remains unclear whether we should expect actual- or perception-based corruption measures to be more responsive to the EITI, but this poses an interesting issue future research might seek to examine further (data permitting).

Ideally, we would also have a corruption measure focused on the extractive industries, but such international measures do not currently exist. The application of the BCI here is based on the understanding that changes in corruption in extractive industries are also likely to affect cross-sector indicators (even if the extractives sector does not entirely determine the score and will likely create a conservative estimate of the true effect). It is worth noting that the selection of this type of cross-sector measure is consistent with the type of measures used in existing EITI studies. This creates an interesting exercise that examines whether the use of this new indicator draws similar conclusions to those reached with commonly used indicators.

To further justify why this measure makes a particularly interesting indicator compared with other corruption indicators already featured in the EITI literature (such as the CCI and CPI), it is important to understand the relative methodological strengths of the BCI. The BCI keeps the scaling of its index and its model parameters estimating its index constant across time, for instance. This enables it to provide a greater deal of comparability among estimated corruption scores over time than these other alternative indicators. Also, even though the BCI draws information from multiple sources of data (in fact, from the same sources as the CCI), the BCI's

[31] For example, we might expect perception measures could be more responsive to the EITI because they also capture changes arising from reduced misconceptions. However, it is also unclear the degree that perceptions respond to actual changes in corruption. It may be that the EITI deters illicit acts of corruption or embezzlement, as discussed above, but in ways that go unnoticed. Furthermore, historic accounts of corruption may leave a lasting impression on perceptions making them difficult to change.

aggregation approach averts the need for additional data manipulations during the computation of the indicator (such as imputation and sub-level aggregation).

The interested reader may see Standaert (2015) for a detailed description of the composition of the BCI and an empirical review comparing it with other available corruption indicators mentioned in this text. Some of the key findings from the text show that the between-correlations (the correlation between the mean values for each country) between the BCI and other comparable international corruption indicators are generally very high (above 0.9). The within-correlations (between the demeaned values) are, however, much lower (below 0.5). This means that, although the choice of indicator might not have a large effect on the results in a cross-sectional study, the differences between indicators may be significant in a study using time-series or panel data (such as this study). These potentially important differences help to motivate the interest in this study in re-examining the relationship between the EITI and changes in corruption scores using the methodologically more robust BCI measure.

This analysis measures changes in corruption scores between 2002 (the year before the first set of public commitments made to the EITI by participating countries) and 2016 (the year of a major overhaul in the EITI's standards).[32] The period examined is largely recognised as the initiative's inception period before a significant change in the scope of EITI's standard and the way its members' progress is measured (discussed above). As noted in the conclusions below, future research might consider the implications and experiences of members transitioning to the new standards when

[32] This study examines changes until 2016 for two reasons. The first is the availability of the BCI data and the second is that the EITI went into a period of restructuring in late 2016 (changing some of its standards and some fundamental methods of assessing/validating country compliance). The EITI's institutional changes create a discontinuity in the implementation of the EITI and it is too soon to effectively assess these changes as their implementation is often drawn out over 3 to 4-year cycles (which is largely determined by the length of time between each members validation assessment). Here we must also consider the long-term perspective of the initiative and the pace of institutional change. It may take some considerable time for these changes to unfold and become fully operational.

more data for the BCI is made available and sufficient time has elapsed for their effects to have convincingly transpired.

This study focuses on changes in corruption outcomes of developing countries identified by their eligibility for Official Development Assistance (ODA). This focus reflects that the motivations of the limited sample of developed economies (such as the U.K., Norway and Germany) for joining the EITI have been intrinsically different from those of developing countries (which the initiative originally targeted). For example, the U.K. joined the initiative primarily because of the role that its Department for International Development had in brokering the EITI's inception, whereas Norway joined because the EITI Secretariat is in Oslo as well as due to the country's leadership role in the industry. Similarly, Germany is a major consumer of raw materials and a leading aid donor among developed economies, and so the country's membership was intended to reflect its status as a 'role model' to aspiring nations. Thus, Germany's commitment is a largely notional one (e.g. to 'lead by example'), as opposed to strictly one of domestic development (Short, 2014a; von Klencke, 2016).[33]

Member countries participating in the EITI go through different stages. The first stage is for the government of the participating country to publicly announce its *commitment* to the EITI. After this, it needs to develop a work plan that sets concrete objectives (regarding ways to improve transparency in the extractive sector) and establish a multi-stakeholder group together with companies and civil society. Once

[33] It was also considered whether it would be appropriate to conduct an analysis also using developed economies. The issue in doing so is that including more developed economies expands the control group and adds only a few countries to the EITI intervention group. Those that are added to the EITI intervention group are generally outliers in this sample of developed economies (as also highlighted in many respects in text), and so it is questionable whether adding a large group of control countries that do not necessarily represent the additional treatment countries credibly contributes to this comparison. Rather, we focus on the group of countries which the EITI largely targeted during the study period and was originally intended for at its inception.

these steps have been carried out, the country moves to the second stage by formally applying to the initiative to become a *candidate* country. Candidate countries are then required to work towards fulfilling the initiative's various standards (requiring full and timely disclosure of financial and contractual information stipulated in its transparency standards, a continuous and effective functioning multi-stakeholder group, and so forth). The EITI uses audits to assess when countries reach the third stage. In the third stage, countries are validated as *compliant* with the EITI's standards (Papyrakis et al. 2017).

To verify members' compliance with its standards and to ensure the requirements are upheld, the initiative's international secretariat's validation team reviews information provided by each member according to its standards. Here the onus is on the country's multi-stakeholder group and supporting national bodies to provide evidence of compliance with the standard. After reviewing the information provided by each country, the secretariat's validation team will offer the multi-stakeholder group the opportunity to discuss preliminary findings at a teleconference and may also undertake targeted virtual stakeholder consultations, consult the international secretariat's country team, or draw on external experts to seek further information at this stage. In exceptional cases, especially if there are severe concerns related to stakeholder engagement, the validation team may visit the country to undertake in-person consultations and seek further information. The EITI board in the international secretariat make the final assessment determining the compliance status of each country based on the evidence and recommendations from the validation committee and other appointed external experts.[34]

[34] See further information on the EITI validation process here: https://eiti.org/overview-of-validation.

In this analysis, a binary variable represents a country's EITI status. This equals 1 if a country has made a public commitment to the EITI, and 0 otherwise. Data for countries' histories concerning the EITI derives from the online EITI country index (EITI, 2020).[35] This analysis also examines the difference in changes of perceptions of corruption among a subgroup of those countries that have complied with the intended intervention (i.e. among only those countries that are verified compliant EITI members). The binary variable used for the subgroup analysis equals 1 if country *i* is verified an EITI-compliant member country, and 0 if country *i* did not commit to the EITI before 2016. Non-compliant EITI-committed countries are not included in the sub-group analysis (i.e. this compares compliant and non-committed countries only). The analysis does not conduct a subgroup analysis comparing members that reach candidate status against non-member countries because very few members in the sample period did not graduate to candidate status (see Appendix C.1). Some further analysis does, however, consider interacting these EITI variables with the length of time each country has been as a committed or compliant member. Appendix C.1 lists information on the sample of 78 countries included in the analysis and their EITI status. This includes a sample of 33 countries committed to the EITI which have sufficient data available for the analysis. 21 of which were verified compliant with the EITI standard by 2016.[36]

For data pre-processing purposes described below, the data compiled for this analysis also includes information on country characteristics related to both the corruption outcome and the EITI self-selection process. Variable selection is informed

[35] See https://eiti.org/countries for information on EITI country membership.
[36] The sample consist of countries from across the globe. This includes 13 (5, 2) countries from South and East Asia and the Pacific, 8 (3, 3) from Europe & Central Asia, 21 (7, 2) from Latin America & Caribbean, 36 (18, 14) from the Middle East and Africa. Note the number of EITI-committed and compliant countries are in parenthesis.

by relevant studies by Pitlik (2010) and Lujala (2018) who examine factors correlated with EITI membership. This includes variables for GDP per capita, as well as the relative economic size of natural resource rents, trade, FDI, and aid to GDP. Other variables include state polity, the incidence of conflict, the freedom of the press, and a measure of each country's pre-EITI corruption score (measured by the BCI). Note that a broader literature also justifies that the inclusion of pre-intervention outcomes can improve the efficacy of observational estimators (see Jaciw, 2016; Fenton Villar and Waddington, 2019). Finally, this list of variables includes the interaction between corruption scores and the economic importance of resource rents. This reflects the discussion by Lujala (2018), who found that countries with high rents and high levels of corruption may be intrinsically less likely to join the EITI. Appendix C.2 further provides detailed definitions and information on each of the variables included in this analysis, and Appendix C.3 presents a table of descriptive statistics.

Identification strategy

This analysis starts by adopting a difference-in-difference approach, which is analogous to the approach by Sovacool et al. (2016). A difference-in-difference approach calculates the average effect by simply taking the differences in the observed changes in outcomes among countries in the EITI intervention group and those not in the EITI intervention group (a control group). The control group is intended to measure what would have happened to beneficiaries in the absence of the intervention, thereby controlling for secular trends in the outcome variable.

To formally outline this estimator using a common language to express observations potential outcomes, here we further define some basic notation. We denote the EITI intervention variable using a simpler term D, where $d \in \{0,1\}$. EITI

countries remain represented by the value 1 (as described above). T defines a variable representing two time periods, where t ∈ {0,1}. Period zero indicates the intervention baseline year, 2002, and period one denotes the year 2016. Also, X is a matrix of J exogenous pre-intervention characteristics from t_0 such that X_{ij} then denotes the value of the jth characteristic for country i and $X_i = [X_{i1}, \dots, X_{ij}]$. With this basic notation, we may index observations potential outcomes by the potential states of the intervention variable, where Y_t^d denotes the outcome that would be realized for a specific value of d in period t.

Using the potential outcomes notation defined above, the difference-in-difference estimator's average effect is formally described by the notation $\mathrm{E}[Y_{t+1}^1 - Y_{t0}^1 \mid D = 1)] - \mathrm{E}[Y_{t+1}^0 - Y_{t0}^0 \mid D = 1)$. In a regression framework, the difference-in-difference approach using panel data is equivalent to estimating the following equation:

$$\Delta Y_i = \alpha + \beta D_i + \varepsilon_i. \qquad \text{(i)}$$

Where ΔY represents the change in the corruption outcome variable between 2002 and 2016 for country i. D is the binary EITI variable described above. The parameter α estimates the time-trend (i.e. the average change in corruption outcomes) observed among control countries. β is the estimated average difference in changes in corruption scores between EITI members and the control group. Finally, ε is the error term.

This estimator infers a common trend which assumes that, in the absence of the EITI intervention, the difference between treatment and control groups outcomes would remain the same over time (i.e. that $\Delta Y_t^d \perp D_t \mid D = 0$, where $\mathrm{E}[Y_{t+1}^0 - Y_{t0}^0 \mid D = 1) = \mathrm{E}[Y_{t+1}^0 - Y_{t0}^0 \mid D = 0]$). It is important to note that this does not mean that

there is no trend in the outcome variable in the counterfactual state (only that the trend is analogous across the treatment and control groups). It also does not mean that the level of the outcome variable for the two groups must be the same in the pre-treatment era. However, empirical assessments indicate that minimising the baseline differences in compared sample characteristics can help improve efficacy and reduce the bias associated with observational difference-in-difference estimators (see Glazerman et al., 2003; Jaciw, 2016). In other words, this indicates that comparing groups that are observationally similar at baseline can increase the plausibility of the common trends assumption.

To do justice to the portion of the methodological literature that supports using data pre-processing approaches to minimise the baseline differences between compared sample characteristics, this analysis also considers adjusting the simple difference-in-difference framework using Hainmueller's (2012) method of entropy balancing,[37] which involves creating an adjusted control group of non-EITI countries using a re-weighting procedure that minimises the baseline inequalities between member and non-member countries' characteristics.[38] More formally, here the counterfactual outcome is denoted $\mathrm{E}[\widehat{Y_t^0|\mathrm{D}=1}] = \frac{\sum_{\{i|D=0} Y_i \omega_i}{\sum_{\{i|D=0} \omega_i}$. The outcome variable in the difference-difference regression framework described above is simply adjusted using the procedure's estimated weights (ω):

[37] The *Stata* package -ebalance- creates the weights using the *entropy balancing* method described in Hainmueller (2012).

[38] To estimate the weights the balancing scheme searches for the set of unit weights (ω_i) taking the loss function $\min_{\omega_i} H(\omega) = \sum_{i|D=0} h(\omega_i) = \sum_{i|D=0} \omega_i \, log\,(\frac{\omega_i}{q_i})$ subject to; i) the balance constraint $\sum_{\{i|D=0} \omega_i c_{ri}(X_i) = m_r$ with m_r representing the EITI intervention groups first moment for covariate X_i, ii) the normalizing constraint $\sum_{1|D=o} \omega_i = 1$, and iii) the non-negativity constraint $\omega_i \geq 0$ for all i such that D=0. This is provided that Q is the base weight $[q_i, \ldots, q_{n_0}]^T$, where $q_i = \frac{1}{n_0}$ and n_0 is the number of potential control observations, and $c_{ri}(X_{ij}) = (X_{ij} - \mu_j)^r$ with mean μ_j.

$$\Delta Y_i \omega_i = \alpha + \beta D_i + \varepsilon_i. \quad \text{(ii)}$$

Hainmueller (2012) discusses in greater detail the similarities and advantages of entropy balancing compared with alternative pre-processing approaches available, such as the better-known propensity score matching method. In particular, they highlight the practical advantages of directly measuring the balance of covariates (as opposed to, say, a propensity score). This approach obviates the need for the researcher to manually iterate between modelling the propensity score and checking whether pre-specified covariates are stochastically balanced while also ensuring that pre-specified covariates are balanced (which indirectly matching on propensity scores does not guarantee).[39] Through simulations and empirical evidence from within-study comparisons, Hainmuller also highlights entropy balancing's appealing finite sample properties and both demonstrate the estimator's efficacy (i.e. ability to mitigate bias) relative to other common matching techniques. The efficacy of the entropy balancing estimator has also recently been confirmed in further empirical testing provided by Matschinger et al. (2020) and Wang (2020).

3.4 Results

We now examine the results of this analysis. First, Panel A in Table 7 compares the baseline characteristics (from 2002) of the group of EITI-committed countries to the control group of non-EITI-committed countries. The comparison shows that the

[39] Hainmueller's (2012) discussion describes the practical limitations and the inadequacies of alternative approaches based on propensity score theory (also known as the propensity score paradox - see King and Nielsen, 2019). Our own experiences resemble this common practical problem explained by the propensity score paradox. We were unable to find a comparable – "well balanced" – control group using propensity score matching. The approach improves the balance between EITI and control countries for some covariates and decreases balance for others (which can counteract bias reduction). As further explained by Hainmueller (2012), Entropy Balancing provides a key methodological contribution in addressing this issue by focusing on directly providing covariate balance.

characteristics of the EITI and non-EITI countries are statistically similar in some respects, but also considerably different in others. For example, whereas the standardised mean differences (SMDs) are very small for covariates related to countries' polity (-0.035), FDI (-0.07), and press freedom (-0.058), SMDs for factors such as log GDP (0.810), aid (-0.815), and corruption (-0.749) are particularly large and statistically significant. Panel B in Table 7 provides details of this comparison limited to a sub-group of EITI countries who progressed to reach compliant status during the study period. We see the same pattern also exists here; log GDP, aid, and countries corruption scores remain significantly different in EITI-compliant countries compared to non-EITI-committed countries.

A degree of selection bias between these groups at baseline is not necessarily an issue, given that a difference-in-difference estimator may intrinsically account for this type of bias where the assumption of common trends holds. However, as noted in the description of the identification strategy, increasing the similarity of observed groups may help to improve the plausibility of this estimator. The column headed 'Adjusted Control' (Adj. Control) in Table 7 provides the results of re-weighting the control group using the entropy balancing procedure. The comparison shows that the entropy balancing procedure works well in creating an alternative control group that is observationally comparable to the EITI-committed group at baseline. The adjusted control group's SMDs are negligible across the included covariates, and this is also the case when performing the same re-weighting procedure to balance the control group with the group of EITI-compliant countries (see Panel B). Thus, we continue further reflecting on the findings inferred from both unadjusted and adjusted control groups (as well as examining the common trends assumptions below).

Table 7. Summary of country characteristics in 2002

	Panel A: EITI Countries				
	EITI Mean	**Control Mean**	**Pooled SD**	**Control SMD**	**Adj. Control SMD**
Log GDP	8.025	8.816	0.977	0.810***	0.000
Natural Res.	6.007	4.629	9.400	-0.147	0.000
Aid	7.527	2.748	5.862	-0.815***	0.000
FDI	3.214	2.916	4.287	-0.070	0.000
Trade	69.290	71.788	36.188	0.069	0.000
Polity	3.182	2.978	5.856	-0.035	0.000
Conflict	8.198	8.563	1.762	0.207	0.000
Press Freedom	52.120	53.240	19.360	0.058	0.000
Corruption	58.960	51.240	10.312	-0.749***	-0.001
Corrupt*Nat.Res	357.700	225.700	523.089	-0.252	0.000
Observations	33	45	78	78	78
	Panel B: EITI Compliant Countries				
Log GDP	7.884	8.816	0.981	0.951***	0.000
Natural Res.	6.372	4.629	9.393	-0.186	0.000
Aid	9.216	2.748	6.139	-1.054***	-0.001
FDI	3.855	2.916	4.587	-0.205	-0.001
Trade	65.170	71.788	32.891	0.201	0.000
Polity	2.333	2.978	5.987	0.108	0.000
Conflict	8.312	8.563	1.735	0.145	-0.001
Press Freedom	55.900	53.240	19.033	-0.140	0.001
Corruption	59.110	51.240	10.871	-0.724***	-0.001
Corrupt*Nat.Res	383.400	225.700	517.800	-0.305	0.000
Observations	21	45	66	66	66

Notes: SD = Standard Deviation. SMD = Standardised Mean Difference. SMD is calculated by dividing the difference between treatment and control group mean values by the pooled standard deviation. Superscripts *, **, *** correspond to a 10, 5 and 1% level of significance from a t-test with robust standard errors.

However, before doing so, it is also interesting to note some of the differences among countries that have progressed to compliant status during this period in our sample. Comparing the means in panels A and B of Table 7, we see that EITI-compliant

countries are more aid-dependent and less democratic than the average EITI-committed country. We also find that, on average, compliant countries tend to be countries with lower incomes but where foreign investment appears relatively more important. Finally, although the values are somewhat similar, the perceived levels of the incidence of corruption, the relative economic importance of natural resource rents, and their interaction are also higher in compliant countries. These findings are in line with the expectation as well as previous evidence (see Lujala, 2018) that the countries hypothesised to benefit the most from implementing the EITI are also those most likely to progress with its implementation. This implies that a simple comparison of the size of the average relative change in corruption scores between EITI-committed countries and the sub-group of EITI-compliant countries may not be directly attributable to countries' progression in the EITI.

However, further attempts to address this issue using the entropy balancing technique to minimise the baseline inequalities between EITI-committed and EITI-compliant countries were unsuccessful. This reflects a known limitation of this re-weighting procedure (i.e. that it may not converge to a balanced solution). The universe of countries here is very small (only 12 EITI-committed countries in the sample may serve as a control for the group of EITI-compliant members). This may explain the limited overlap between these two samples. The analysis, therefore, continues reporting and discussing the differences between the results of EITI-committed countries and a sub-group of compliant members to each group's respective adjusted control group of non-EITI countries. However, it should be cautioned that this provides only intuitive evidence of the difference in the effects between countries that are respectively committed to, and fully compliant with, the

EITI. As noted above, it is not clear whether the difference in effects can be attributed to countries' progression with the implementation of the EITI.

Table 8 presents the analysis examining the changes in corruption scores according to the BCI. The changes reported are scaled using the pooled standard deviation of the level of corruption in the baseline year (2002). When using an unadjusted control group (i.e. the group not using entropy balancing), the results in Panel A in Table 8 show that between 2002 and 2016, the differences in changes in corruption scores between EITI-committed and non-EITI countries were small. Here, whereas the coefficient labelled 'change' (Chg) shows that perceptions of corruption improved (i.e. scores decreased) by 0.070 standard deviations in non-EITI countries during this period, the difference-in-difference (DiD) coefficient shows that the average decrease in corruption scores was only slightly larger (0.025 standard deviations) in EITI-committed countries relative to non-EITI countries. Limiting the analysis to the sub-group of EITI-compliant countries, the estimates in Panel B of Table 8 show similar (but slightly larger) improvements in EITI countries. The difference-in-difference estimate indicates that the change in corruption scores was 0.128 standard deviations lower in EITI-compliant countries relative to non-EITI countries. However, in neither instance are the difference-in-difference coefficients statistically significant.

In contrast to the estimates from the unadjusted control group, looking at the estimates from the adjusted control group obtained from the entropy balancing procedure, we find that the relative improvements in perceptions of corruption measured by the BCI are statistically significant. The results show that, after adjusting for the baseline differences in country characteristics, the average change in corruption scores between 2002 and 2016 was 0.347 standard deviations lower in

EITI-committed countries relative to non-EITI countries. This estimate is significant at a 5% confidence level. The results also indicate that improvements in perceptions of corruption were slightly better in the sub-group of EITI-compliant countries. The estimates show that the average change in corruption scores was approximately 0.391 standard deviations lower in EITI-compliant countries relative to the adjusted control group. In this instance, the difference-in-difference coefficient is significant at a 1% confidence level.

Table 8. Changes in Bayesian Corruption Indicator Score

		Panel A: EITI Countries			
		Control		**Adj. Control**	
Study period	**Obs.**	**Chg**	**DiD**	**Chg**	**DiD**
1997-2002	78	0.014	0.038***	0.066**	-0.014
		(0.009)	(0.011)	(0.026)	(0.026)
2002-2016	78	-0.070	-0.025	0.252*	-0.347**
		(0.073)	(0.110)	(0.145)	(0.166)
		Panel B: EITI Compliant Countries			
1997-2002	66	0.014	0.037***	0.069**	-0.018
		(0.009)	(0.011)	(0.029)	(0.029)
2002-2016	66	-0.070	-0.128	0.193	-0.391***
		(0.073)	(0.118)	(0.163)	(0.187)

Notes: Chg provides the change in the corruption scores in the control group measured in standard deviations (i.e. it is the parameter α in the difference-in-difference regression equation in Section 3.2). DiD reports the corresponding difference-in-differences between the EITI and control group (i.e. it corresponds to the β coefficient in the difference-in-difference regression equation in Section 3.2). The results are estimated using OLS regressions. Control refers to the estimates using the unweighted control group and Adj. Control the estimates using the weighted control group; weights are derived from the entropy balancing approach described above. Obs. is the number of countries included in the analysis. Superscripts *, **, *** correspond to a 10%, 5% and 1% level of significance. Robust standard errors are reported in parenthesis ().

Much in the same way that it is not simple to comprehend the practical meaning of a point change in the underlying BCI index, comprehending the magnitude of the size of this change reported in standard deviations can be challenging as well.

However, one benefit of examining the results measured in standard deviations is that this figure can be easily transformed (or converted) into an intuitive and well-known improvement index based on Cohen's U3 index (Cohen, 1988).[40] Concerning the results reported above, an effect size decreasing the average corruption score by 0.347 (0.391) standard deviations in the treatment group indicates that 64% (65%) of the treatment group score lower than the mean score in the control group – in other words, a 14% (15%) relative improvement. This does not appear to be a transformative improvement, but it nevertheless appears to indicate a marked improvement that is by no means meagre.

Estimations using both the unadjusted and adjusted control group infer perceptions of the incidence of corruption have improved in EITI countries. However, the discrepancy concerning the significance of these findings does raise a point for concern. One explanation for the difference in these findings might be that the pre-treatment differences in the unadjusted control group are creating non-parallel outcome dynamics (which would bias the DiD estimator). To examine this issue further, here we assess the validity of the common trends assumption associated with the DiD estimator using an 'in-time placebo test', which re-applies the same analysis to outcomes before countries were exposed to the EITI intervention. It is expected that before the inception of the EITI, the estimated difference in the changes in corruption between the control group and EITI group should not be larger than what we might expect to occur by chance. Empirical analysis has shown that this type of test is a useful

[40] This transformation simulates two perfectly overlapping standard normal curves (one for the treatment group and one for the control group) to illustrate the magnitude of the estimated effect. The approach involves comparing the proportion of area under the normal curve given the standard deviation shift in means inferred by the estimated effect and interpreting this in terms of percentiles. For example, if there was no effect, the 0 standard deviation difference between the means of the treatment and control group indicates 50% of members in the treatment group would score higher than the mean of the control group (and 50% of members in the treatment group would score lower than the control group mean).

method for detecting poorly performing observational estimators that are more susceptible to bias (Glazerman et al., 2003).

In this application, we examine a placebo test for the period 1997 to 2002, which covers the period where BCI data for the full sample of included treatment and control countries is available. The results of this robustness test are presented alongside the main estimates in Table 8. They indicate that changes in corruption were significantly different between EITI-committed countries and the unadjusted control group even before the EITI's inception. The DiD coefficient shows that, in the period between 1997 and 2002, changes in corruption scores were 0.038 standard deviations higher in EITI-committed countries relative to non-EITI countries. This difference is significant at the 1% confidence level. Similarly, focusing on the analysis for the sub-group of EITI-compliant countries in Panel B in Table 8, we see that changes in corruption outcomes were also significantly higher (approximately 0.037 standard deviations) in EITI-compliant countries before its inception. Again, this finding is also significant at the 1% confidence level. This undermines the plausibility of the difference-in-difference estimator's assumptions for the results using the unadjusted control group. The placebo test results using the adjusted control group, on the other hand, show the DiD coefficients in the pre-EITI period are not significant. This, therefore, increases our confidence in the main findings using the adjusted control group; that the perceptions of corruption have improved significantly (and corruption scores decreased) in EITI countries relative to non-EITI countries.

To further examine the robustness of the results from the estimator using entropy balancing, another type of test considers a natural extension of Rosenbaum's sensitivity analysis (a test that is widely used for matched observational studies) (see Rosenbaum, 2002). Adapted by Soriano et al. (2021) for the entropy balancing

approach, this test assesses the degree that the estimates would change due to 'hidden bias' caused by unobserved confounding variables. The test's results provide a critical value of 2.45 for the estimates using the EITI-committed country sample and 2.65 for the model using the sub-sample of EITI-compliant countries. In other words, these unobserved factors would need to more than double the likelihood of being an EITI country to overturn the main findings. This test cannot rule out that some degree of unobserved confounding exists in the current estimates. However, these test results do indicate that the reported estimates are reasonably insensitive to this potential type of bias based on common thresholds used to interpret the test's critical value.[41]

Some further analysis also considered examining whether progress among EITI members is related to countries' characteristics. This included, for instance, interacting the EITI variable with the length of time each country has been as a committed or compliant member, as well as other baseline characteristics (such as natural resource rent dependence, aid dependence, and the level of corruption). The coefficients of the interaction terms used to test such effects were consistently small and statistically insignificant.[42] This may suggest that changes in corruption outcomes are relatively abrupt rather than gradually growing over time (similar to the trajectory of the effects in Zambia reported by Fenton Villar and Papyrakis, 2017). However, one issue here is that the time variable may be a poor indicator of the maturity of the initiative. The discussion above highlighted that several countries were seen to be 'dragging their heels' with the implementation of the EITI's standards. Some countries progressed very slowly despite having been members for several years, whereas others adapted to the standards very quickly. This suggests that a more accurate

[41] For example, Duvendack and Palmer-Jones (2012) suggest the critical values should exceed between 1.5 and 2 if the estimates are reasonably invulnerable to this 'hidden bias'.
[42] The estimates are omitted for brevity. Results are available from the author.

representation of maturity may simply be each member's EITI status (as seen in the results above).

Finally, additional results available in Appendix C.4 compare these findings to those using three corruption indicators more conventionally adopted in the cross-country literature on the EITI and corruption. This includes examining the estimated outcomes using the Political Risk Services (PRS) Group corruption indicator, the World Governance Indicators Control of Corruption Index (CCI) and Transparency International's Corruption Perception Index (CPI) (Appendix C.2 reports further variable descriptions).[43] As discussed previously, the additional results from these indicators should be interpreted with a degree of caution. The CCI and CPI indicators contain inherent limitations concerning their measurement of corruption over time, and the PRS indicator creates annual scores using only a single set of subjective opinions from 'experts' and offers little transparency about the consistency in their measurement. Also, in two instances, the entropy balancing procedure did not converge to a consistent weighting solution. This explains why the adjusted control results are not reported for the PRS indicator when using the sample of all committed EITI countries or the CPI for the sub-sample of EITI-compliant countries.

From these additional results, we see that the estimates obtained from these alternative corruption indicators are generally aligned with those obtained using the more contemporary BCI outcome variable. In particular, the DiD estimates are negative for both the adjusted and unadjusted control groups.[44] However, the lack of

[43] The signs on the coefficients for Chg and DID are inverted reflecting that the scales for these indices point in the opposite direction to BCI's. Hence, a positive coefficient in Appendix 4 continues to indicate a higher incidence of corruption and a negative coefficient that the perceived incidence of corruption is lower.

[44] An exception exists when using the PRS indicator with the unadjusted control group, but the positive coefficients are not statistically significant at conventional levels and the coefficient turns negative when using the adjusted control group (albeit also insignificant).

correspondence concerning the statistical significance of the results also highlights the headline conclusions drawn from existing flagship EITI studies using these alternative indicators (e.g. Sovacool et al., 2016 in World Development) may be sensitive to the type of EITI member and the corruption measure used, as well as the estimator applied. For example, if we examine the results of the CCI indicator in Appendix C.4 using the unadjusted control group, we see the results show that the relative changes in corruption scores among EITI members have been significant only among the sub-sample of compliant countries (indicating that conclusions are temperamental depending on the definition of EITI member type, as also recently shown by Sovacool, 2020). These results also contrast with the results from the more robust BCI indicator (which is based on the same sources of information as the CCI). The results from estimates using the BCI and the unadjusted control group indicate that the changes have not been significant in the EITI-compliant group. This emphasises that the corruption indicator used is also an important factor determining the conclusions of existing studies.

3.5 Conclusion

The advent of the EITI constituted a major step toward a more transparent extractive sector in countries across the globe. However, in recent years, interest in the initiative has stimulated a vigorous debate questioning its adequacy to tackle the sector's corruption problem. Whereas its proponents highlight the potential benefits of the EITI to the governance of the extractives sector, critics often point out the common limitations surrounding its implementation. The question, therefore, remains whether its members have experienced any improvements in their scores from international assessments of the prevalence of corruption. This study uses a

state-of-the-art corruption indicator, called the Bayesian Corruption Indicator (BCI), combined with an estimation strategy using a difference-in-difference (DiD) model and an entropy balancing technique to address the measurement and self-selection issues prevalent in existing studies on the progress of EITI members. It finds that, on average, corruption scores have improved significantly in EITI countries compared to non-EITI countries after adjusting for baseline differences between these groups of countries' characteristics.

Further analysis also looks at the relationship between the EITI and corruption among a sub-group of members compliant with the international standards. The results provide even stronger evidence of the relationship between EITI membership and improvements in corruption outcomes. However, a limitation of this study remains that it is unable to generalise whether changes have occurred more strongly during a particular stage of implementation (e.g. when countries are joining the initiative or after they become compliant). This is largely due to the differences in the 'expected potential benefits' profile of compliant members. It may be that those countries that have already progressed with the initiative stand to benefit the most from its implementation. If this is the case, these countries may naturally have benefited more from commitment to the EITI compared to the slow and late adopters. Nevertheless, reflecting that, on average, more corrupt and resource-dependent countries with lower incomes (the type of country the EITI was most keenly intended for at its inception) have been likely to progress with the implementation of the initiative, it is intuitively encouraging to see from these findings that progress has been strongest (even if the results are only slightly stronger) among the sub-group of compliant members.

Concerning the policy implications of this research, this evidence does not advocate the EITI as a policy panacea that will eradicate corruption in the extractive industries. It is clear from discussions on its implementation that the initiative must continue to strengthen its standards, stringency, and local outreach to ensure it remains relevant (particularly as its membership continues to mature). Nonetheless, this evidence supports the positive role that the EITI may play in helping to develop the policy environment, infrastructure and capacity required to stimulate better governance of the extractive industries. As highlighted by Van Alstine (2017), the initiative may use transparency as a necessary 'entry point' to help build a better mutual understanding among stakeholders and stimulate changes in public governance and management. With this in mind, the recent package of changes to further support the EITI's standards and verification process remains relatively fresh; as such, their full implications may take some time to manifest. An interesting line of future research may consider the implications of transitioning to new standards on EITI members' experiences. Furthermore, examining how institutional changes to the EITI's standards have caused differences in early and late adopters' experiences with its uptake and implementation also offers another interesting avenue for future research.[45]

Cross-country assessments of the EITI, such as this study, offer important insights into suggestive empirical regularities involving changes in corruption outcomes among members across the globe. Nevertheless, as this study also highlights, methodological challenges and limitations inevitably exist with this approach. Further research might consider exploring sub-national variations in

[45] Considering the effects of the EITI's transition to new standards should consider the long-term perspective of the initiative and the pace of institutional change. The evaluations of this initial phase are occurring after more than 15 years since the EITI's inception and patience is needed for understanding the effects of these changes as it is important to allow events to properly unfold.

citizens' interactions with public officials and with the EITI as an alternative approach for identifying the distribution of the EITI's effects. Consideration should also be given to research seeking to understand how different modes of information provision and stakeholder deliberation may help to maximise the benefits of increased transparency.

A final point for discussion concerns whether this type of initiative is relevant or could be expanded to other sectors. This has been a lively and interesting issue even among stakeholders in the EITI itself. For instance, in Ghana, extensive work has taken place over the past 10 years seeking to incorporate natural resource-based industries beyond the mining sector into the remit of its EITI scheme. This included a bill put to Ghana's parliament in 2012 to expand the scope of the EITI to cover other sectors, such as forestry and fishery. Expanding the EITI's scope to the forestry sector has also been a prominent issue in other countries, such as Tanzania.[46] This highlights that the EITI's model does indeed appear highly relevant to other sectors as well. Important factors that typically distinguish the EITI from many other (often local) transparency schemes include that its mechanism is based on a set of internationally developed technical standards and that it has a validation process overseen by an independent international secretariat (which also provides leadership through capacity building and training activities). Land deals and land registration are other related topics drawing considerable advocacy towards the need to improve transparency.[47] Whether an EITI type multi-stakeholder initiative with an international validation and membership scheme could help to support efforts on such issues warrants further research.

[46] See https://eiti.org/document/tanzania-scoping-study-on-forestry-sector

[47] E.g. see related discussions by Deborah Horan (2013) on Devex at: https://www.devex.com/news/how-to-ensure-transparency-in-land-deals-81859.

Chapter 4.

The Extractive Industries Transparency Initiative (EITI) and trust in politicians

This study examines the role of a long-standing international transparency scheme known as the Extractive Industries Transparency Initiative (EITI) in helping build trust in politicians. In doing so, it presents the first known econometric investigation studying the relationship between the EITI and trust. It applies a novel instrument using the variation in neighbouring countries' EITI participation to control for the endogenous nature of one's own EITI involvement. The basis of this instrument reflects on a broader body of literature concerning the historic influence of policy-borrowing in the geographical diffusion of public policies. It finds a positive relationship between countries' EITI membership and trust in politicians. In particular, estimates offer consistent evidence of significantly improved levels of trust in members that are compliant with the EITI's international transparency standards.

Keywords: EITI; Extractive Industries; Transparency; Trust

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4.1 Introduction

Drawing on the philosophical underpinnings of John Steinbeck's 1947 novel *The Pearl*, in 2012, Kolstad and Wiig formalised the 'Pearl hypothesis',[48] which argues that societal trust can be damaged by the pressure of socially dysfunctional political behaviour caused by the contestation of natural resource wealth. Although empirical research has continued to increase our understanding of the formation of political distrust surrounding natural resources (particularly noting the exacerbating role of conflict and corruption in this relationship), it also highlights the relative lack of evidence concerning the potential role of public policies in helping to build trust in state–society relations (Ishiyama et al., 2018; Acemoglu et al., 2018; Armand et al., 2019). This study aims to examine the role of the Extractive Industries Transparency Initiative (EITI), a leading and long-standing international transparency scheme in the extractives sector, in helping to build trust in politicians.

To provide some context to this study, the EITI is globally recognised as the hallmark transparency scheme in the extractive sector. Fifty-three countries have publicly committed to implementing its standard, and more than 42 countries have progressed beyond the initiative's first (i.e. candidacy) stage, becoming officially designated as compliant with EITI guidelines (EITI, 2019). The initiative requires that member countries adhere to international 'rules' on financial and contractual disclosure standards and also that they maintain a national multi-stakeholder group comprising private, public, and civil society representatives (to promote stakeholder dialogue) (Sovacool et al., 2016).[49] The EITI ensures that its members adhere to its standards by requiring each member country to undergo an independent assessment

[48] 1962 Nobel prize award winner in Literature.
[49] Details of the various disclosure requirements are provided here: https://eiti.org/document/standard

verifying their compliance. Historically, the length of time taken for countries to become full-fledged members is significant; on average, it takes 17 months merely to become formal candidates after making a public government commitment to the initiative, and a further four years to progress their implementation to comply with the initiative's standards (Lujala, 2018).[50]

Although Carter (2013) describes that historically development interventions have rarely presented trust-building as an objective, the EITI provides a particularly interesting policy in this respect. Despite not featuring explicitly within the initiative's core principles (which instead focus on factors such as enhancing accountability, economic growth and the business environment; see EITI, 2003), since the EITI's inception in 2003, building public trust has been a key aspect of its impetus (Okpanachi and Andrews, 2013; Short, 2014a). This arises in part from extractive companies' desire to appear socially responsible actors despite frequently operating in countries widely perceived as corrupt (see Gillies, 2010), but it is also attributable to government officials seeking to use the EITI to help dispel perceptions that they are complicit in corrupt dealings with private companies. For example, Eigen (2009) describes the motivation of Zambian officials in joining the EITI as one of seeking to address common misunderstandings about public contracts and deals with private companies in the sector. The EITI's proponents maintain that its international standards on contractual transparency may help to remove barriers to public oversight in the extractive industries and that the EITI may increase public confidence in – as well as the accountability of – systems of public management.

[50] Following validation of their compliance, countries are required to re-validate their compliance periodically, at least every 3 years. Further details of the joining and verification process are available here: https://eiti.org/join-EITI.

Furthermore, even though the EITI did not immediately codify this trust-building objective, for many stakeholders this appeared to be the main purpose of the EITI. For example, in conflict-torn Liberia, President Ellen Johnson Sirleaf and Senator Milton Findley identify increasing levels of trust as a key outcome of the initiative (see Rich and Warner, 2009; NRGI, 2015). Sven Ulrich Renner (Program Manager for the World Bank's Extractives Global Programmatic Support (EGPS) Multi-Donor Trust Fund) also highlights building public trust as one of the most important aspects of the EITI (EITI, 2018). Despite limited direct mentions of trust-building in the EITI's formal project documents, the increasing salience of trust-building conveyed by stakeholders has now encouraged the EITI to bring this concern to the foreground of its programme identity. A re-branding project under the slogan 'Open data, build trust' has featured in the EITI's published media since 2019.

In addition to being the leading example of an intervention with public trust-building objectives at the core of its rationale, when compared to other transparency interventions previously examined in this sector, the EITI is also a particularly interesting development intervention. Existing evidence studying public trust and transparency interventions in the extractive industries largely focuses on short-lived interventions (mostly involving relatively modest degrees of stakeholder interaction) (e.g. Armand et al. 2019; Coleman et al., 2019). Broader theory on the dynamics of trust, however, indicates that trust is an intangible form of capital that takes time to accumulate as partnerships and relationships evolve (Lewicki and Wiethoff, 2000; Drescher et al. 2014). For instance, it may be that trust develops in tandem with consistent signs of intent and interactions between stakeholders. The EITI, therefore, offers an interesting intervention given that its lifespan is both long-term and continuous. It also requires public commitments (i.e. signals of intent) from high-level

government officials in countries wishing to join the initiative, and it encourages regular and consistent stakeholder dialogue over time (e.g. combining the dissemination of information on the extractive sector with the creation of a national multi-stakeholder group).

Using data from the World Economic Forum, this analysis contributes the first known quantitative study of the relationship between the EITI and trust. Featuring econometric analysis applying fixed- and random-effects regressions, this study examines the relationship between trust and the EITI following different stages of participation in the initiative (i.e. initial commitment, candidature, and full compliance). It also uses an instrument measuring the variation in neighbouring countries' EITI participation to control for the endogenous nature of each country's individual EITI involvement. The basis of this instrumental variable reflects on the growing body of research concerning the influence of policy-borrowing in the geographical diffusion of public policies (Walker, 1969; Simmons and Elkins, 2004; Simmons et al., 2006).

Overall, the findings show a positive relationship between EITI membership and trust in politicians. In particular, this study finds consistent evidence of significantly improved levels of trust in countries that are compliant with the EITI's international transparency standards. This chapter continues in Section 4.2 with a review of synergies linking natural resources, transparency and trust. Section 4.3 then presents the empirical analysis, which includes a more detailed description of the data and estimation strategy, as well as the results of the analysis. Finally, Section 4.4 further discusses the findings and provides some concluding remarks with respect to policy and future research.

4.2 Natural Resources, Transparency and Trust

Many prominent economists, such as Jacob Viner (1953), Arthur Lewis (1955) and Walter Rostow (1961), have asserted that economies extracting natural resources should benefit financially from improved capital flows and public revenues. More recently, Miller (2015) has further highlighted that these positive economic benefits should increase trust in political leadership given that the economy is an important determinant of political trust. However, following the predictions of the Pearl hypothesis, empirical research now shows that public distrust is more likely to form in countries engaged in extracting natural resources (Kolstad and Wiig, 2012; Ishiyama et al., 2018).

Most explanations consider that this phenomenon may relate with a broader literature dedicated to the 'political resource curse'. Research on the political resource curse suggests that the large public revenues arising from extractive activities may incentivise rent-seeking behaviour (Armand et al., 2019). Politicians, for example, may become more interested in securing political power and pursuing corrupt and inefficient policies using these revenues for their private gain (Robinson et al., 2006). This became particularly apparent among the events that prompted the creation of the EITI (such as in Angola, where the private oil companies were found to be complicit in helping politicians plunder public assets during its civil war in the 1990s; see van Alstine, 2017). Some researchers argue that these issues have exacerbated local political conflicts in many contexts and perpetuated perceptions that public leaders and extractive companies act in illicit cahoots (Aaronson, 2011; Arellano-Yanguas, 2011; Orihuela et al., 2019). Others consider the influences of the political resource curse in perpetuating a vicious cycle that may deepen inequalities or ethnic divides, and even reignite armed conflict in post-conflict transitions (e.g. Le Billion, 2014).

However, many scholars argue that the negative externalities caused by natural resource extraction are not inevitable. In recent years, a more critical understanding of extractive industries' role in international development maintains that institutional and social issues surrounding natural resources can be mitigated (Stevens et al., 2015; Lahn and Stevens, 2017; Dietsche, 2017). Driven by a combination of internationally high-profile cases of corruption during the 1990s and early 2000s, this line of thinking has been a key factor determining the rise of a transparency agenda in the extractive sector led by the EITI over the past two decades (Short, 2014b; van Alstine, 2017).

Following years of informational opacity concerning economic activity in countries' extractive industries, the EITI's advocates commonly hypothesise that the EITI may help to improve trust in public leaders where increased levels of transparency dilute information asymmetry, prevent publicly damaging cases of corruption, and help promote better governance of natural resource wealth (Aaronson, 2011; Gillies and Heuty, 2011; Sovacool et al., 2016). It is also thought that transparency will help remove barriers to oversight and thereby increase confidence in the public system of management and accountability (Okpanachi and Andrews, 2013). Similar reasoning suggests that increased transparency may help to rectify (or prevent) potentially damaging misunderstandings or misconceptions concerning the public management of a country's extractive industries (Eigen, 2009).

Further to this, Magno and Gatmaytan (2017) explain that by providing a platform for different actors in the sector to work together and increase communication (e.g. via the EITI's multi-stakeholder groups) the EITI may contribute to building a culture of open dialogue surrounding the management of natural resources. This deliberation mechanism may act as an alternative form of transparency whereby it enables stakeholders to obtain greater clarity and ask

questions about the information disclosed through the EITI. Bebbington et al. (2017) also highlight the influence of the EITI on the policy environment, noting that politics surrounding transparency in the extractive sector has been less susceptible to changes in the national political landscape among EITI members compared to non-members. This consistency may be (at least in part) motivated by the publicity otherwise caused when governments renege on, or fail to meet, their own EITI commitments.

The latter of these points implies a broader point concerning the outward political appearance that EITI membership may send to the public. Although members' motives for joining the initiative are commonly considered economic (e.g. to help attract foreign investment and aid; Lujala, 2018), EITI commitments may also act as public displays symbolising a political will to embrace good governance (Öge, 2016). Such public signals may encourage trust in public leaders; so too may more consistent policy messages conveyed across time (e.g. Majone, 1996).

However, these views are not uncontested. De Regt (2015) argues that transparency relates to surveillance and also that it reinforces the cycle of suspicion rather than promoting trust. For example, greater transparency may simply provide further reason to distrust public sector leaders. McDevitt (2017) further describes potentially trust-eroding events when EITI assessments identified nearly USD 10 billion of missing revenue payments in Nigeria. Nevertheless, Short (2014a) suggests that evidence of corruption does not necessarily translate to the erosion of trust, explaining that the EITI helped increase public trust in Nigeria. This has also created greater expectations that these issues will begin to be addressed and, furthermore, McDevitt (2017) subsequently reports that the Nigerian government has begun to recoup some of these 'missing' funds.

An extensive body of literature also questions the fidelity of the EITI's requirements. Here critics regularly highlight the potential susceptibility of the initiative to 'mock compliance'. Such criticism argues that the EITI enables governments to appease the international community without inducing meaningful changes (Öge, 2016). One example of an issue that may contribute to these practical limitations is that governments can choose the multi-stakeholder group members who represent them at the EITI (thereby limiting public engagement because governments can appoint favourable representatives to the group). Another issue of concern is that, in many contexts, company reporting to the EITI remains voluntary. Consequently, reconciliation of company and government reporting may not provide complete information (Fenton Villar, 2019).

Some recent (albeit few) studies have further examined the potential role of transparency in building public trust in the extractive industries. A recent randomised experiment by Coleman et al. (2019) in Uganda's Western Region examined whether multi-stakeholder forums in the oil and gas sector increased participants' trust that decision-makers share important information with the public. The forums informed community members about oil companies' planning cycles, their rights and how to exercise them, and helped them to develop discussion priorities when engaging with oil companies and the government. The study's findings show that trust increased significantly in communities that participated in the multi-stakeholder forums.

Another example by Armand et al. (2019) combines a randomised trial with lab-in-the-field experiments to evaluate the effects of disseminating information about the revenues and employment generated by resource extraction alongside citizen-led meetings to discuss priorities for spending extractives revenues in Mozambique. Measuring trust in community leaders, the provincial government, and national

leaders using self-reported survey questions, they find a significant positive effect on trust when citizen-led meetings were combined with the sharing of such information to leaders and citizens. However, the effects of the information sharing intervention without these meetings were statistically insignificant. When measuring trust through a game, the analysis did not find significant effects across intervention sites for information dissemination alone nor for information dissemination combined with citizen meetings (Rathinam et al., 2019).[51]

One limitation of the mixed findings in the latter of these studies may concern the external validity of the trust indicators originating from the game. For example, in other behavioural literature, Verschoor et al. (2016) reflect on lab-and-life discrepancies that can occur. Other reflections may also consider that these previous studies have used relatively limited interventions, often involving no more than a few short-lived community meetings. A broader body of literature on the dynamics of trust indicates that trust is something that develops over time (Lewicki and Wiethoff, 2000; Drescher et al., 2014). In this case, it may be that the effects of transparency interventions only become more appreciable when we look at long-term interventions encouraging regular interactions and consistent signals of intent from stakeholders.

This further highlights the interesting nature of the characteristics of the EITI and the contribution insights that an analysis of the initiative may begin to provide in this research domain. In particular, unlike previously studied interventions in this sector, the EITI is a sustained intervention that has been undertaken over an extended period of time. The EITI also requires substantial public international commitments

[51] The trust game involved 10 participants from the community (citizens) and the community leader. Each citizen was given an endowment of 100 meticais, in the form of 10 tokens worth 10 meticais each. Citizens had to decide to keep this income for themselves or send a portion to the leader. Funds sent to the leader were tripled. The leader then had to decide how much of this tripled amount to give back to the citizen.

from the highest levels of national governments as well as regular stakeholder interaction through multi-stakeholder groups. Yet, despite the interesting nature of EITI, evidence examining the relationship between the EITI and trust remains scarce. Bickham (2015) offers one notable example of a qualitative evaluation examining the EITI and trust from the perspective of supporting mining companies. He argues that the EITI has played a significant part in changing attitudes towards transparency and accountability in the extractives sector and that this has helped to build a dialogue improving trust among the sector's stakeholders in member countries. However, to the best of our knowledge, broader quantitative evidence supporting these findings is lacking.

4.3 The EITI and Trust in Politicians: An Empirical Analysis

Next, this study presents an empirical cross-country investigation examining the relationship between EITI status and trust in politicians. The following section describes the details of the variables and the estimation strategy used. Note that Appendix D.1 to D.4 contains further information on countries' EITI statuses and provide details for each of the variables. It then presents the results of this analysis.

Data and estimation strategy

In this empirical analysis, we assess the relationship between countries' EITI membership and public trust in politicians using a widely recognised measure deriving from the World Economic Forum's (WEF) Global Competitiveness Index. Asking respondents 'In your country, how would you rate the ethical standards of politicians?'; the variable responses ranged between the values 1 and 7 (with higher

values indicating higher levels of trust). Each country score reflects the average of the respondent's answers. The World Bank's Open Trade and Competitiveness database (TCdata360) publicly lists this data for each country.

To provide greater context for the selection of this variable, data on trust at a country level is typically somewhat limiting for cross-country econometric purposes. It tends to be collated somewhat infrequently (e.g. the World Values Survey collects data approximately once every five years) and information providers that do create more frequent assessments of trust often do so only for a small set of countries (e.g. see the Edelman Trust Barometer or the OECD's Trustlab initiative). The trust data used here, however, benefits from being compiled annually from an executive opinion survey during the period 2007 to 2016 and includes information for a broad cross-section of countries participating (or not) in the EITI.

To analyse the relationship between the EITI and trust in politicians, we examine regressions with the general form:

$$TRUST_{it} = \beta_0 + \beta_1 EITI_{it} + \beta_2 X_{it} + \mu_i + \tau_t + \varepsilon_{it} \quad \text{(i)}$$

The variable denoted TRUST is the dependent variable representing the trust indicator from the WEF for country i in year t. The dependent variable for trust is standardised using the samples' pooled standard deviation to simplify the interpretation of our estimates. The EITI variable is a binary variable representing EITI status; this takes the value 1 when country i participates in the EITI in year t, and equals 0 otherwise. X represents a vector of control determining both the dependent variable and countries' EITI membership status (discussed below). The parameters β_0, β_1, and β_2 in eq. (i) are the intercept and the coefficients of the EITI variable and control variables, respectively. Meanwhile, τ_t captures the common year-specific fixed

effects. The parameters μ_i and ε_{it} are the country-specific and variable components of the error term, respectively. The analysis focuses on developing countries reflecting that the limited sample of developed economies participating in the EITI – such as the U.K, Norway and Germany – largely reflects a notional commitment as opposed to one that is strictly developmental (see Fenton Villar, 2019).

The regressions distinguish among three EITI (participation) variables. These refer to a country reaching any of the three consecutive stages in EITI implementation during the study period. The variables are *EITI commitment*, *EITI candidate*, and *EITI-compliant*. Papyrakis et al. (2017) and Fenton Villar and Papyrakis (2017) further discuss countries' joining process, noting that the first stage (commitment) follows a public statement of a government declaring their intention to join the initiative. The second stage (candidate) follows the completion of a formal application, which also requires a country to convene a multi-stakeholder group together with companies and civil society and to create a work plan outlining the steps intended to ensure that the country meets the EITI's international standards. Finally, a country becomes a fully compliant member of the EITI once it proves that it meets the initiative's various requirements, such as regular disclosure of financial and contractual information. The EITI's independent administrators verify members' compliance with the initiative's international standards. Data for countries' histories concerning the EITI is extracted from the online EITI country index (EITI, 2019).

The analysis also considers different specifications of this regression. First, to do justice to discussions by Clark and Linzer (2015), Dieleman and Templin (2014), and Papyrakis et al. (2017), we examine a random-effects (RE) specification. They further discuss the trade-off between the fixed-effects (FE) (eq. 1) and random-effects estimators in cross-country research, noting that the random-effect estimator may be

more precise even if it consists of hard-to-justify assumptions compared to the fixed-effects model.

Second, we also consider that even the more robust fixed-effects estimator may be susceptible to issues concerning endogeneity when unobserved variables are time-variant or when time-invariant unobserved variables jointly affect both the outcome variable and the selection process determining whether a country participates in the EITI (Kasekende et al., 2016; Lujala, 2018). To address the potentially confounding nature of these issues, we consider instrumenting the EITI variable based on information on the EITI participation outcomes of neighbour countries. Using information on countries' land borders, we create a binary variable (NEIGHBOUR) indicating whether country *i* has a bordering neighbour that has committed to the EITI (1) or not (0). Further specifications consider using neighbour candidacy and compliance status as an instrument, as well as a measure of the proportion of neighbours with a particular EITI status.

The intuition behind using this neighbour variable as a basis for an instrumental variable derives from a broader literature from the field of political science discussing the geographical diffusion of public policies (Walker, 1969; Simmons and Elkins, 2004; Simmons et al, 2006, Meseguer, 2009; Fernandez and Lutter, 2013; Mitchell and Petray, 2016; Gilardi and Wasserfallen, 2019). This literature discusses several reasons why public policy-borrowing may occur, including competitive, coercive and imitative motives (see Dobbin et al., 2007; Shipan and Volden, 2008). For example, increased adoption of the EITI in a region may increase political pressure for close economic rivals to follow suit (so as to prevent other nations from increasing their relative competitiveness for limited aid and investment flows). It may also be that a country becomes more amenable to adopting a policy originating

from policymakers in other countries with which they share commonalities (i.e. coerced to 'join the club', so to speak). Alternatively, the presence of a policy in a relatable context reduces the perceived political risks associated with introducing the EITI domestically. This may trigger greater policy imitation in nearby countries.

However, the application of the instrumental variable approach to a binary endogenous treatment variable offers complications in practice. Popularly dubbed the 'forbidden regression' by Jerry Hausman (2001), suppose we were to use a non-linear first-stage regression (such as a probit regression) to obtain the predicted values of the endogenous EITI variable to plug into the second stage regression. This approach does not guarantee that the residuals of the first-stage regression would be uncorrelated with the fitted values and other covariates. Neither the expectations operator nor the linear projections operator passes through a non-linear first stage; therefore, the fitted values from a first-stage probit model are uncorrelated with the second stage error term only under very restrictive assumptions unsuitable for applied settings. Only an OLS regression is guaranteed to produce first-stage residuals that are uncorrelated with fitted values (Greene, 2008).

We circumvent this obstacle by performing a procedure further described by Wooldridge (2002, pp. 623–625), which consists of performing a 2SLS regression using the predicted probability of EITI participation ($Pr_{EITI} = E(EITI \mid X, NEIGHBOUR)$) as an instrument in the first stage of the 2SLS regression (see eqs. (ii) and (iii)). Cerulli (2014) further compares the efficacy of this estimation procedure when addressing binary endogenous variables against the conventional 2SLS estimator (which would entail featuring the NEIGHBOUR variable in the 2SLS first-stage regression in this instance). He highlights the procedures advantages in terms of both bias reduction and modelling efficiency.

$$EITI_{it} = \beta_0 + \beta_1 Pr_{EITI_{it}} + \beta_2 X_{it} + \mu_i + \tau_t + \varepsilon_{it} \quad \text{(ii)}$$

$$TRUST_{it} = \beta_0 + \beta_1 \widehat{EITI_{it}} + \beta_2 X_{it} + \mu_i + \tau_t + \varepsilon_{it} \quad \text{(iii)}$$

Finally, the analysis considers both parsimonious as well as rich specifications of the model. Rich specifications add control variables in vector *X* that may correlate with countries' EITI membership status as well as the outcome variable. This includes variables for GDP per capita, natural resource rents, trade, FDI, aid, polity, corruption the incidence of conflict, and freedom of the press (Pitlik, 2010 and Lujala, 2018). This also includes a variable reflecting the values for the interaction between corruption scores and the economic importance of resource rents. This reflects the discussion by Lujala (2018) that countries with high rents and corruption may be intrinsically less likely to join the EITI. Appendix D.2, D.3, and D.4 provides further information on variables' definitions and details.

A common practice in applied econometric analysis involves using the lags of the control variables in regression specifications to purge problems caused by reverse causality and other related issues that may cause variable endogeneity. Recent research shows this practice to be a less-than-perfect solution to identification, given that it requires satisfying strong assumptions concerning the dynamics of unobservables (Bellemere et al., 2017). Nevertheless, in the absence of instruments to sufficiently 'exogenise' the controls, we examine richer specifications with lagged controls for illustrative purposes. Also note that identification using the instrumental variable estimator does not necessarily require such control variables. Here the benefit of including additional control variables in the instrumental variable regression is based on the grounds of model efficiency, albeit at risk of sacrificing model consistency (e.g. Frolich, 2008; Deuchert and Huber, 2017).

Results

We now examine the results of the empirical analysis. In Table 9, we start by examining the findings from parsimonious specifications of the random- and fixed-effects regressions. The results show that neither the random- nor the fixed-effects versions of the regression equation detect a statistically significant relationship between either EITI commitment or candidate status and trust in politicians. However, we do find evidence of a significant positive relationship between country compliance with the EITI and trust in politicians. The reported coefficients from random- and fixed-effects regressions represent estimates of improvements in trust of approximately 0.228 and 0.245 standard deviations, respectively; both models' coefficients are significant at a 5% confidence level.

Table 9. Random- and Fixed-Effects Regressions on Trust in Politicians: Parsimonious Specifications

	(1) RE	(2) RE	(3) RE	(4) FE	(5) FE	(6) FE
Commit	0.024			0.074		
	(0.133)			(0.144)		
Candidate		0.057			0.089	
		(0.093)			(0.098)	
Compliant			0.228**			0.245**
			(0.105)			(0.107)
Constant	0.083	0.078	0.085	-0.331***	-0.330***	-0.320***
	(0.268)	(0.264)	(0.264)	(0.056)	(0.050)	(0.049)
Obs.	919	919	919	919	919	919
R-squared	0.190	0.187	0.183	0.106	0.107	0.123

Notes: Robust standard errors of coefficients in parentheses. Superscripts *, **, *** correspond to a 10, 5 and 1% level of significance.

Next, Table 10 presents the findings from random- and fixed-effects regressions using richer specifications including control variables that may also relate with countries' uptake of the EITI. In line with the results of the parsimonious specification,

neither the random- nor the fixed-effects regressions detect a significant relationship using either the EITI commitment or candidacy variable. Again, however, there is evidence of a significant and positive relationship between EITI compliance and public trust in politicians. Having controlled for other economic and institutional factors, we find that the random- and fixed-effects models detect a statistically significant (at the 5% level) improvement in trust of approximately 0.251 and 0.235 standard deviations, respectively.

Taking a moment to examine the coefficients of the other variables in the regressions reported in Table 10, let us note the significant negative effect of corruption on trust (as predicted). The coefficients of other variables, however, remain largely insignificant. This may be because in cases where two variables are highly correlated, this may inflate the models' variance. For example, examining the correlation matrix highlights a high degree of correlation exists between the corruption and trust variables ($\rho = -0.775$; see Appendix D.4). Alternatively, another explanation may be that there is some degree of over-adjustment bias whereby the inclusion of an intermediary factor in a regression biases conclusions towards the null hypothesis (Schisterman et al., 2009; Cook and Ranstam, 2017). For example, Kolstad and Wiig (2012) previously argued that the relationship between natural resources and trust operates indirectly through the effect of natural resources on conflict and corruption.

A degree of caution should be taken when dropping highly collinear variables from regression specifications (see O'Brien, 2017). Nevertheless, further analysis removing both the conflict and corruption variables from regressions (see Appendix D.5) does not change the qualitative conclusions inferred from our random- and fixed-effects regressions seen in Tables 1 and 2. The EITI compliance variable remains

significantly and positively related to trust, albeit at a 10% confidence level. Meanwhile, neither of the regression models detects a significant relationship with either the EITI commitment or candidacy variables. However, the results for the positive coefficient for the Log GDP variable do change, becoming highly significant at the 1% confidence level. The coefficient for the natural resources variable also turns negative, although it remains insignificant.

Table 10. Random- and Fixed-Effects Regressions on Trust in Politicians: Rich Specifications

	(1) RE	(2) RE	(3) RE	(4) FE	(5) FE	(6) FE
Commit	0.037			-0.028		
	(0.098)			(0.098)		
Candidate		0.055			0.003	
		(0.065)			(0.063)	
Compliant			0.251**			0.235**
			(0.099)			(0.095)
Natural Res.	0.006	0.005	0.001	-0.026	-0.026	-0.036
	(0.012)	(0.012)	(0.012)	(0.045)	(0.045)	(0.044)
Log GDP	-0.131	-0.131	-0.142	0.200	0.208	0.114
	(0.093)	(0.094)	(0.090)	(0.391)	(0.386)	(0.404)
Aid	0.001	0.001	0.001	0.002	0.002	0.002
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Trade	-0.000	-0.000	-0.000	0.002	0.002	0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
FDI	0.004	0.004	0.004	0.004	0.004	0.004
	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)
Polity	-0.021**	-0.021**	-0.020**	-0.002	-0.002	-0.000
	(0.009)	(0.009)	(0.009)	(0.013)	(0.013)	(0.013)
Conflict	0.043	0.042	0.054	0.048	0.047	0.062
	(0.035)	(0.035)	(0.033)	(0.044)	(0.043)	(0.041)
Freedom	0.003	0.004	0.004	0.001	0.001	0.002
	(0.004)	(0.004)	(0.003)	(0.007)	(0.007)	(0.006)
Corruption	-0.083***	-0.083***	-0.083***	-0.105***	-0.105***	-0.105***
	(0.007)	(0.007)	(0.007)	(0.015)	(0.015)	(0.013)
Corrupt*Nat.	0.000	0.000	0.000	0.001	0.001	0.001
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Constant	5.042***	5.040***	5.036***	2.938	2.864	3.486
	(1.189)	(1.202)	(1.114)	(3.903)	(3.864)	(3.917)
Obs.	648	648	648	648	648	648
R-squared	0.755	0.755	0.759	0.394	0.394	0.409

Notes: Robust standard errors of coefficients in parentheses. Superscripts *, **, *** correspond to a 10, 5 and 1% level of significance.

To provide a more parsimonious look at the relationship between natural resources and trust in politicians, the analysis also looked at regressions including only the resource variable as a control (see Appendix D.6). Again, in line with the broader Pearl hypothesis, the regressions are unable to detect the expected positive economic effects that natural resource revenues may have on trust. In the regressions examined further to this, the results also did not detect a significant relationship if we only included the resource variable in the regression (i.e. excluding EITI variables).

Table 11 reports the results of the instrumental variable approach using parsimonious specifications. The columns headed (1) refer to the model using the EITI commitment variable as the treatment variable, whereas those columns headed (2) and (3) refer to the models using the candidate and compliance variables, respectively. Examining the coefficients for the instrument Pr_{EITI} in the first stage of the 2SLS regression (1-2SLS) reveals that the variable is both positively and significantly related to EITI participation in country *i*. The *f*-statistic at the bottom of the table further highlights the strength of the fitted values as an instrument, with values far greater than the conventional rule of thumb of 10 across the three models.

The results of the second stage of the 2SLS regression (2-2SLS) in Table 11 also show that, although EITI commitment is not significantly related, both EITI candidacy and compliance positively relate with trust in politicians. The coefficients of the candidate and compliance variables are significant at a 5% confidence level and are substantially larger than the estimates previously given by the random- and fixed-effects regressions. In this instance, the coefficients indicate that EITI candidacy relates with an improvement of approximately 0.571 standard deviations in trust in

politicians. The coefficient for the compliance variable is slightly larger and indicates an improvement in trust scores of approximately 0.625 standard deviations.

Table 11. Instrumental Variable Regressions on Trust in Politicians: Parsimonious Specifications

	(1) 1-2SLS	(1) 2-2SLS	(2) 1-2SLS	(2) 2-2SLS	(3) 1-2SLS	(3) 2-2SLS
Commit		0.016				
		(0.313)				
Candidate				0.571**		
				(0.282)		
Compliant						0.625**
						(0.292)
Pr_{EITI}	0.951***		1.018***		1.016***	
	(0.119)		(0.157)		(0.044)	
Constant	-0.087	0.858	0.067	1.767	0.044	1.397
	(0.810)	(1.366)	(0.929)	(1.610)	(0.815)	(1.169)
Obs.	865	865	752	752	682	682
Instrument F-stat.	64		42		51	

Notes: Robust standard errors of coefficients in parentheses. Superscripts *, **, *** correspond to a 10, 5 and 1% level of significance.

The findings from the instrumental approach using richer specifications, presented in Table 12, further confirm the results from the parsimonious specifications. The coefficients for the instrument Pr_{EITI} remain significant and positively related to EITI participation. The candidacy and compliance variables coefficients also remain positive and significant. However, the size of the coefficients are substantially smaller, indicating increases of approximately 0.372 and 0.334 standard deviations, respectively. The results of the richer instrumental variable specifications also highlight a significant and positive relationship between EITI commitment and trust. The control variables coefficients are, again, also largely insignificant. Excluding the corruption and control variables does not change the significance of the other control variables coefficients in this instance but the statistical significance of the EITI variables is sensitive to their inclusion (see Appendix 7). However, here we should also be cautious in making inferences from these results

because the regression's identification is also conditional on the somewhat stringent assumption that the lagged control variables are exogenous.

Table 12. Instrumental Variable Regressions on Trust in Politicians: Rich Specifications

	(1) 1-2SLS	(1) 2-2SLS	(2) 1-2SLS	(2) 2-2SLS	(3) 1-2SLS	(3) 2-2SLS
Commit		0.418***				
		(0.094)				
Candidate				0.372***		
				(0.114)		
Compliant						0.334***
						(0.088)
Pr_{EITI}	1.014***		0.981***		1.066***	
	(0.060)		(0.073)		(0.041)	
Natural Res.	-0.000	0.006	0.001	0.009	-0.003	-0.008
	(0.011)	(0.047)	(0.018)	(0.048)	(0.012)	(0.048)
Log GDP	0.000	-0.206	0.007	-0.305	0.026	-0.468
	(0.149)	(0.311)	(0.189)	(0.319)	(0.110)	(0.345)
Aid	-0.000	-0.000	-0.000	-0.001	0.000	-0.003
	(0.004)	(0.008)	(0.005)	(0.008)	(0.003)	(0.008)
Trade	-0.000	0.003	0.000	0.003	-0.000	0.002
	(0.001)	(0.002)	(0.001)	(0.002)	(0.000)	(0.003)
FDI	-0.000	0.001	-0.000	-0.000	0.002	0.001
	(0.001)	(0.004)	(0.001)	(0.004)	(0.009)	(0.004)
Polity	0.000	0.028	-0.001	0.023	0.002	0.014
	(0.008)	(0.025)	(0.010)	(0.025)	(0.017)	(0.027)
Conflict	0.001	-0.039	-0.003	-0.034	0.005	0.016
	(0.026)	(0.039)	(0.028)	(0.039)	(0.009)	(0.041)
Freedom	0.000	-0.002	-0.000	-0.001	0.001	-0.004
	(0.003)	(0.007)	(0.003)	(0.007)	(0.002)	(0.007)
Corruption	-0.000	-0.090***	0.000	-0.090***	-0.000	-0.091***
	(0.005)	(0.011)	(0.005)	(0.011)	(0.003)	(0.011)
Corrupt*Nat.	0.000	-0.000	-0.000	-0.000	0.000	0.000
	0.000	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)
Constant	0.091	4.267***	-0.034	4.614***	0.024	4.435***
	(0.501)	(0.963)	(0.691)	(0.949)	(0.483)	(0.886)
Obs.	537	537	537	537	486	486
Instrument F-stat.	285		180		666	

Notes: Robust standard errors of coefficients in parentheses. Superscripts *, **, *** correspond to a 10, 5 and 1% level of significance.

Further analysis also explored neighbouring countries' respective candidate or compliance status in the instrumental variable procedure, as well as the proportion of neighbours participating in the EITI as an instrument in a conventional 2SLS

approach. In the first instance, the instruments derived from variables concerning the neighbouring country's candidate or compliance status did not significantly relate with EITI commitment, candidacy or compliance. The corresponding variables concerning the proportion of neighbours participating in EITI also proved to be weak instruments, with *f*-tests concerning instrument strength below even the conservative rule of thumb of 10. Bound et al. (1993) details the various problems associated with weak instruments, namely inconsistent estimation and increased risk of finite sample bias. Therefore, we do not consider these variables sufficient for inclusion as valid instruments in this analysis.

Another extension considered using the corruption indicator (the Bayesian Corruption Indicator, or BCI) as an outcome variable in instrumental variable equations. The analysis did not find a statistically significant relationship between the EITI variables and the corruption variable. However, again, it should be cautioned that this does not necessarily constitute contradictory evidence against the findings of previous studies that have detected a significant relationship between the EITI and corruption variables (e.g. Papyrakis et al., 2017; Fenton Villar, 2019). A limitation of the instrumental approach concerns its degree of model inefficiency (given that the variance of the errors in 2SLS is relatively large). Although significant evidence of a relationship may instil confidence in a finding, it is often difficult to validate a null (statistically insignificant) result because this approach is susceptible to type II errors. This is due in large part to the relatively small sample size and sluggish behaviour of macroeconomic variables in this context. Such characteristics of the data are likely to increase the estimate's susceptibility to this problem (e.g. Crown et al., 2011; Boef et al., 2014).

4.4 Conclusion

In this chapter, we take a first look at the relationship between a longstanding multi-stakeholder transparency intervention (i.e. the EITI) and trust in politicians. We examine the relationship between the EITI and trust following different stages of participation in the initiative (i.e. following initial commitment, candidature and full compliance) and also by using different econometric approaches. Overall, this study finds evidence of a positive and significant relationship between EITI participation and trust in politicians. Using random- and fixed-effects regressions, it finds a positive and significant relationship between EITI compliance and trust in politicians. It also uses an instrument measuring the variation in neighbouring countries' EITI participation to control for the endogenous nature of one's own EITI involvement. In doing so, the estimates consistently corroborate that EITI compliance is positively and significantly related to trust. This study also finds evidence of a positive and significant relationship between EITI candidacy and improved levels of trust in politicians.

These findings contribute further evidence to a growing body of literature on the effects of multi-stakeholder transparency interventions in the extractive industries on public trust. In particular, whereas prior studies examining short-lived interventions offer mixed evidence of their effects on trust, this study highlights the potential importance of sustained transparency interventions. Although such interventions may not amount to a panacea, theories of trust dynamics suggest that appreciable improvements in trust may accumulate over time or with consistent signals of intent. This point offers an interesting avenue for future policy research wherein interventions track the evolution of trust outcomes in greater depth over time. Extensions to this research would also benefit from examining the discrepancies highlighted in previous studies between levels of trust reported from surveys and those

originating from trust games. This current study is based solely on levels of trust measured from self-reported survey data.

Furthermore, this study uses only cross-country analysis to examine the relationship between the EITI and trust. Further research would benefit from insights given by in-depth analysis within individual countries as well as at a local level. The discussion laid out various mechanisms through which the EITI may influence trust – for example, by increasing communication and dialogue with civil society, removing perceived barriers to oversight, and offering public signs of commitment to good governance. Such research would be well placed to better explore these various mechanisms, how they may work in different contexts (e.g. within the limited number of post-conflict settings the EITI works in), and – more precisely – the extent of their role or perceived importance in enhancing trust among the EITI's different stakeholders. This also raises a broader question of efficacy that could be explored, which concerns what types of approaches or strategies for communicating the EITI's information may be most appropriate and appealing to types of stakeholders operating at different levels (i.e. local, regional, national and international).

Finally, this analysis also provides some further insights into the so-called 'Pearl hypothesis'. Here we do not detect a significant positive relationship (i.e. a 'resource blessing') between natural resources and trust. If we exclude key mediating variables such as corruption and conflict from our panel regressions, the results even show coefficients turning negative (albeit they are statistically insignificant). Future research in this nexus might aim to shed light on why people may feel politically marginalised by resource booms, a how it may be possible to ensure more inclusive use of the public revenues generated by natural resources.

Chapter 5.

Demand for information and transparency in natural resource governance: Insights from new global data

It is widely predicted that introducing greater transparency to the extractive industries will help to tackle the incidence of corruption in the sector. However, very little is currently known about public demand for information about the sector or the factors related to the variation in demand for such information. Using a new dataset on global demand for information from the Extractive Industries Transparency Initiative (EITI) – the extractive sector's flagship international transparency organization – this first study is the first to track public demand for information from a transparency initiative in the extractive industries, both through time and across different countries. Examining monthly fluctuations in demand for information, this study finds that aggregate global demand follows secular patterns in global mineral prices, thus highlighting the EITI's potential vulnerability to trends in the public's policy interests. Cross-country regressions also show that demand for information from the EITI appears to be higher among wealthier, more open economies with lower perceived levels of corruption and higher levels of accountability. This contrasts with the expected beneficiaries of the EITI scheme, while also highlighting the need for improved communication and engagement strategies that target countries with weaker and challenging institutional settings.

Keywords: EITI; Extractive Industries; Transparency

5.1 Introduction

The extraction of mineral resources is widely viewed as offering an opportunity to help relax constraints on economic growth and, through the revenues it generates, create wealth and economic prosperity. However, over the last few decades, the scientific and policy community has developed a more critical understanding of the potential negative effects of economies' dependence on resource extraction. Epitomised by a socio-economic phenomenon coined the 'resource curse', it is highlighted that economies that are more dependent on resource extraction often grow at a slower rate than less dependent economies (Sachs and Warner, 2001). Alongside explanations indicating the potential problems of de-industrialisation and the economic volatility created by the negative externalities of the commodity markets, the mismanagement of mineral wealth is also regularly cited as one of the main causes of the resource curse (van der Ploeg, 2011). For example, the extractive sector is now widely perceived as one of the world's most corrupt economic sectors.[52] In many contexts, this is perceived to have affected public trust in government, increased public demand for consumption of revenues, and exacerbated local political conflicts (Collier, 2017; Fenton Villar, 2020).

Largely viewed as a problem that can thrive on opacity in public management, efforts to broaden the provision of public information in natural resource management has been promoted across the international community to help address the issues caused by the mismanagement of natural resources (Rustad et al., 2017; Van Alstine, 2017). Although many argue that increasing the provision of information alone will not remedy the various challenges caused by natural resource dependency (e.g.

[52] See OECD Foreign Bribery Report: An Analysis of the Crime of Bribery of Foreign Public Officials. Available online: https://www.oecd.org/corruption/oecd-foreign-bribery-report-9789264226616-en.htm

Kolstad and Wiig, 2009), it is expected that greater transparency in the sector could help to tackle the problem by enabling societies to identify ineffective public expenditure and detect or deter malfeasance (Papyrakis et al., 2017; Fenton Villar and Papyrakis, 2017).[53]

Armand et al. (2019) state that a central assertion underpinning the theory of change associated with these types of initiatives is that a general interest exists amongst the public to understand the issues related to natural resource management and that they can also generate and sustain demand for information about the sector.[54] This becomes a particularly salient issue if we consider transparency interventions providing a more extensive or prolonged effort to tackle the resource curse witnessed at a macro-level. However, very little is currently known about the demand for information following concerted efforts to enhance transparency in the extractives sector or about the factors related to the variation in demand for information (i.e. considering when and where demand accrues). Among the available evidence on this issue, Brunnschweiler et al. (2021) recently conducted a study indicating that the likelihood of individuals actively seeking information about the handling of resource

[53] Several conceptual models exist explaining how information initiatives may help to tackle these issues. Le Billon et al. (2020) synthesises these theories into the following: a) the Naming-and-Shame model, b) the Public Debate model, and c) the Technical Reforms model. The Name-and-Shame model suggests, by publishing information on the details of public financial and contract arrangements, information initiatives may help to curtail public revenue loss by exposing tax evasion, corruption, and embezzlement. This draws on broader transparency theory which suggests reducing information asymmetries between principals (i.e. the public) and agents (i.e. the government) allows the former to monitor the latter. Theoretically, this makes corruption less likely because agents become more likely to act honestly as the risk of getting caught increases. Improving access to information also makes it easier for principals to detect corruption that continues to take place (Bauhr et al., 2019). The Public Debate model (model B) considers that increasing public knowledge about the sector may help to stimulate the public debate required to promote better-informed policies choices and reduce the likelihood of politicians squandering the expenditure of revenues. Finally, the Technical Reforms model (model C) suggests publishing information can reveal shortcomings in governments' management and reporting systems. This may create demand for reform by the pollical elite who are either better informed about poor practices, 'shamed' by these findings, or motivated to improve practices in line with internationally recognised standards (Fenton Villar, 2021c).

[54] Based on this increased demand for information it is expected that a more informed public can leverage its improved knowledge in the public debate process (e.g. through elections or other political means), either by holding the political elite more accountable for their management of the sector or demanding better outcomes through the reform process (Le Billon et al. 2021 and Armand et al., 2019).

revenues in Ghana is positively related to their education, the presence of mining activity, and their political interest (such as whether the respondent was a duty-bearer – i.e. elected or traditional authority – or opinion leader). They also report that citizens who are already better informed about what is happening in the sector are more likely to actively seek information than those who are less informed.

This research contributes a novel study examining factors related to public demand for information on natural resource governance using new global data from the extractive sector's flagship international transparency organization, the Extractive Industries Transparency Initiative (EITI). To provide further context, the EITI – a scheme supported by a range of international institutions[55] – was conceived by the U.K.'s Department for International Development (DFID) in 2003 to help ensure that citizens have access to reliable information about how much their governments receive from the exploitation of their nation's finite mineral resources (Short, 2014b). The organization requires member countries to abide by financial and contractual disclosure standards and then it collates this information into published reports and other forms of online databases for the public to access.[56] In addition to the provision of information, the initiative also requires member countries to maintain a public feedback mechanism in the form of a national multi-stakeholder group (which comprises of private, public, and civil society representatives) and measures members' compliance with its standards using regular independent validation assessments (Sovacool et al., 2016).[57]

[55] E.g. the United Nations, the African Development Bank, the World Bank, and the International Monetary Fund

[56] Since 2016, the remit of the information disclosure has also expanded considerably, and the type of information now reported covers a broad range of issues related to the governance of natural resources. For example, this includes information on the distribution of revenues, environmental payments, and beneficial ownership.

[57] Details of the various disclosure requirements are provided here: https://eiti.org/document/standard

Examining EITI data on the number of people accessing its website to view its online content, this study's empirical analysis of public demand for information is presented in two parts; each examines different types of variation in public demand for information on natural resource governance. The first part of the empirical analysis examines variation in aggregate global demand for information. It investigates whether secular trends in global mineral prices influence monthly changes in aggregate global demand for information. This relates to recent assertions that interest may wane in the EITI through the commodity cycle. Very little data has yet come to light about the prevalence of this issue. Only Rich (2016) provides some anecdotal evidence describing diminishing institutional support during commodity market downturns. This also builds on a growing body of research examining the temporal patterns and fluctuations in public interest in policy issues.[58] In this respect, this study is the first to provide quantitative evidence that both tracks demand and examines factors determining changes in the level of demand for information from a sustained transparency initiative in the extractive industries over time.

The second part of this study's empirical analysis examines the variation in demand for information from the EITI across different countries across the globe. It builds on previous analysis by Pitlik et al. (2010), who studied the demand for information by examining factors related to the binary decision of whether countries join the EITI organization. Here the data on user numbers allows us to look more specifically at the variation in the level of public demand among countries for information from the organization. Furthermore, this study relates to the broader literature investigating factors that predict the public's information-seeking activity

[58] For example, Troumbis (2017) provides evidence of the declining public interest in biodiversity and conservation and Husain et al. (2020) examines factors determining public interest in COVID.

from transparency initiatives. In particular, whereas studies such as that by Piotrowski and Van Ryzin (2007) have previously reported on personal characteristics related to individuals' requests for information (such as age, affluence, and political engagement), this study provides a case study looking at the economic and societal structures related to the variation in information-seeking activity from a transparency initiative.

This study continues in Section 5.2, which provides further information on this study's hypotheses and data. Section 5.3 then presents the results of the empirical analysis. Finally, Section 5.4 discusses the study's findings and provides some concluding remarks concerning future research.

5.2 Study hypotheses and data

This research analyses new global data on public demand for information from the EITI. Key objectives of the EITI since its inception in 2003 have included promoting and mainstreaming the systematic disclosure of government and industry data. Today, it primarily does this by collating and summarising information disclosures on issues such as government revenues and licencing and publishing them through accessible online reports, graphs, informatic images, and databases that are available from its website.

This analysis uses a measure of demand for information from the EITI based on the number of people using its website to view such information. The data has been acquired directly from the EITI's communications team using the website's analytics function. The data includes a time-series of the aggregate monthly global number of users between January 2017 and December 2020 (see Table 13 for descriptive

statistics). It also consists of information on the geographic distribution of users, by country, for 2019 (presented separately below in Figure 4 and Table 14).

Table 13. Table of variable descriptive statistics for global monthly data (Jan. 2017 – Dec. 2020)

Variables	Obs.	Mean	Std. Dev.	Min	Max
Log of users	48	9.726	0.329	9.175	10.806
Log of mineral prices	48	4.373	0.077	4.182	4.601
Δ Log of users	47	0.029	0.280	-0.974	0.925
Δ Log of mineral prices	47	0.006	0.040	-0.086	0.098

The data shows a relatively low level of global demand for information, with an average of approximately 17,000 monthly users of the EITI website. However, this measure is reported with the caveat that this is expected to be a lower-bound estimate of the true level of demand because the EITI's information may also be distributed by gatekeepers (e.g. media, politicians, civil society, multi-stakeholder groups). In this sense, public use of the information reported by the EITI may be more widely used by society than these figures suggest.

The wider use of this information is difficult to properly trace because it may be mentioned in passing or because the source of the information may not be properly cited.[59] Nevertheless, despite providing a lower-bound estimate, we are confident that this data may nevertheless provide informative insights into the patterns and trends in demand for information from the EITI. The first part of the empirical analysis in this study further illustrates this point by looking more closely at whether monthly

[59] Use of alternative technology to track search terms through the internet, social media platforms, and news outlets is also made more difficult by the broader use of possible search terms, such as "eiti", in various societies across the world. To provide a couple of examples, in Argentina the terms appear in the title of the pop music hit 'Eiti Leda' by the rock supergroup Serú Girán. In the Lithuanian and Estonian languages, meanwhile, it commonly appears as a verb "to go".

trends in aggregate global demand for information from the EITI follow secular patterns in global mineral prices.

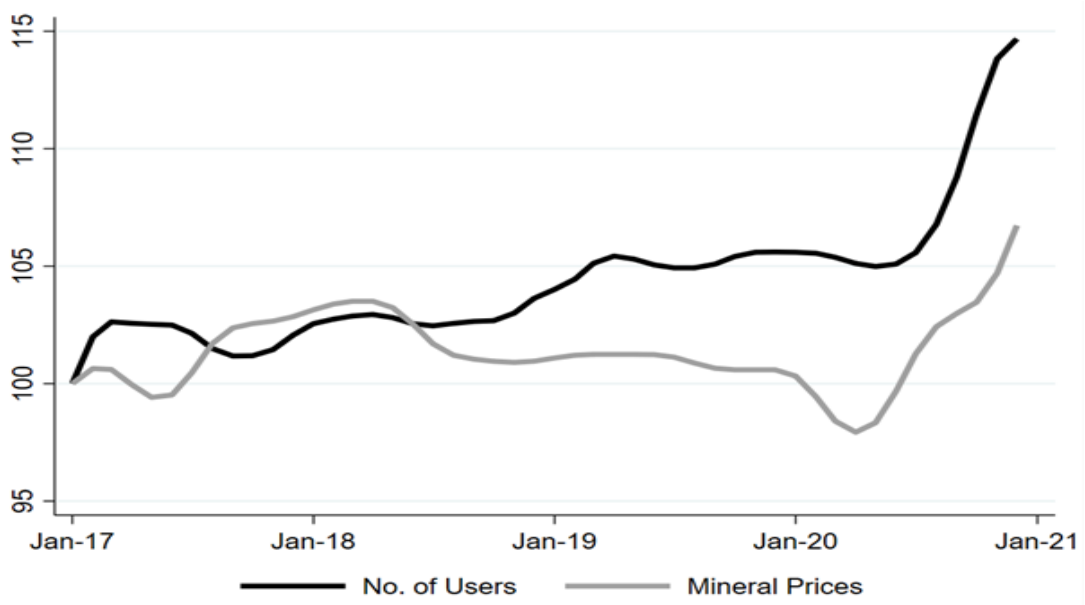
H1. Mineral prices are positively related to fluctuations in the global number of users.

The theoretical foundation of our hypothesis for this analysis between mineral prices and user numbers is based on recent discussions describing the positive relationship between the value of mineral wealth and citizens' expectations about the economic returns of the sector (e.g. Collier, 2017; Fenton Villar, 2021b). As expectations about the potential prosperity of the mineral sector rise, it is expected that sentiment and public interest in the sector will also rise – thus increasing public demand for information about the sector and how its wealth is being managed and distributed. This explains the reasoning behind the conjecture (H1) that mineral prices are positively related to fluctuations in the global number of users. It also relates to recent discussions indicating that interest in the EITI appears to both rise and diminish in line with commodity markets (e.g. Rich, 2016).

As an initial look at this issue, Figure 3 presents the trends of mineral prices (**Log of mineral prices**) as well as the global aggregate number of users (**Log of users**) for the period between January 2017 and December 2020. The data for monthly international mineral prices is from the World Bank's Commodity Price Data Series, and both variables' logged values are indexed with a base value of 100 in January 2017 for this illustration. The graph indicates a general upward trend in global demand for information from the EITI between January 2017 and December 2020. This is in line with the general growth in the number of countries joined as members of the EITI – rising from 53 to 55 – and the progress of many countries implementing

its standards (with 45 countries having been judged by the EITI to have at least made meaningful progress towards implementing its disclosure standards during this time).

Figure 3. Graph of the index of the global number of users and mineral prices



Source: Authors own.

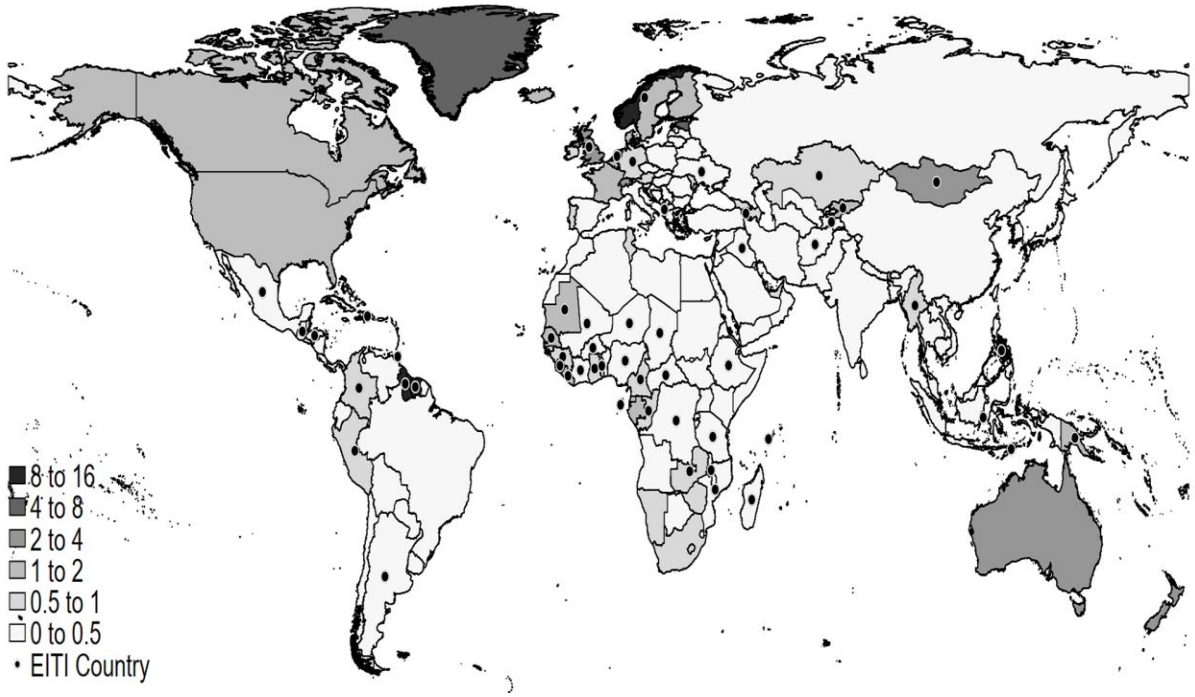
Notes: Graph compares indices of the log of the global total number of users and mineral prices. The indices base value is set to 100 for the period Jan 2017. The indices are created using a running 3-period Hanning linear smoother to illustrate variable trends.

It is also interesting to see that the trend for the global number of users also shows a remarkable resemblance to the trend line for mineral prices. Most noticeably, a period of stagnating mineral prices through 2019 is closely followed by the almost horizontal trend in user numbers, and a large increase in mineral prices in 2020 is later followed by rising user numbers. This provisionally indicates that secular patterns in global mineral prices may indeed be positively correlated with fluctuations in demand for information. The main empirical analysis, which continues below, uses a more formal Granger causality test to further examine this relationship.

H2. Participating in the EITI generates significantly higher user numbers.

The second part of this study's empirical analysis further examines the data on the geographical distribution of global demand for information from the EITI using cross-country regressions. This part of the analysis investigates the societal characteristics related to the variation demand for information from the EITI to identify in which parts of the world demand has been strongest. Figure 4, which displays a map of the global distribution of user numbers per 10,000 people in 2019, suggests that there is a considerable amount of variation to explore among both EITI member and non-member countries.

Figure 4. Choropleth map of the number of users (per 10,000 people) (2019)



Source: Authors own.

It is predicted that EITI member countries will tend to evince significantly higher user numbers than non-EITI countries because joining the EITI generates a significant amount of political attention as governments make (often highly

publicised) announcements committing to participating in the EITI and implementing its disclosure standards (Papyrakis et al., 2017). The EITI's material is also focused on its member countries; therefore, the content available on its website would be expected to be of greatest interest to individuals from these countries.

Furthermore, another point considers whether EITI countries generate user interest as it matures. Armand et al. (2019) posited that a central assertion underpinning these types of transparency initiatives is that they can generate demand for information about the sector. If this is the case, then we would expect user numbers to grow in step with the maturity of a country's membership.

To look at these issues in the empirical analysis, data consisting of countries' histories with the EITI has been extracted from the online EITI country index (EITI, 2021).[60] The data indicates that 53 countries were members of the EITI by 2019. Figure 4 displays the global distribution of EITI membership, and Appendix E.1 lists further information on the sample of countries included in the analysis as well as their EITI status. A binary variable (**EITI**) represents each country's EITI status, which equals 1 if a country was listed as a member of the EITI, and 0 otherwise (see Appendix E.2 for further details on each of the variables included in this analysis). Another way countries participate in the EITI is by supporting the scheme. A country's support for, and affiliation with, the initiative may also generate interest in the information it disseminates about its members (which are also often countries receiving foreign aid from the EITI's supporters). In total, 14 bilateral donor countries are supporting the

[60] For information on EITI country membership see: https://eiti.org/countries.

EITI.[61] A further binary variable (**EITI supporter**) has been created denoting whether a country is a bilateral EITI-supporting country.

To measure countries' maturity in the EITI, the data also includes a variable for the number of years each EITI country has been a formal member of the scheme (**EITI Time**). Alternatively, because the pace of implementation of the EITI's disclosure standards has varied across different countries, Fenton Villar (2021a) also discusses measuring maturity based on the initiative's validation assessment of each country's progress. This assessment is undertaken by the initiative's international secretariat's validation team, which reviews information provided by each member according to its standards (see Fenton Villar 2021a; 2021c for a detailed description of the assessment).[62] Of the 53 EITI countries, 45 have undergone the validation assessment under the updated rules imposed by the EITI in 2016.[63] The results of the validation assessment show that 36 of those 45 have made meaningful progress. The remaining 9 are judged to have gone further and made satisfactory progress. Again, details of countries' specific validation scores are available in Appendix E.1. Two binary variables denote whether a country has been assessed as having made meaningful progress (**EITI Meaningful**) or satisfactory progress (**EITI Satisfactory**).

H3. Internet diffusion is positively related to user numbers.

Of course, there may be several additional factors related to the variation in user numbers. Internet access may be an important factor, given that the outcome measure

[61] The list of EITI supporting countries includes the Netherlands, France, Norway, Denmark, Australia, Japan, Canada, Switzerland, Belgium, Finland, the United States of America, the United Kingdom, Sweden, and Germany. Further information available here: https://eiti.org/supporters

[62] Further information on the validation process is also available here: https://eiti.org/document/eiti-validation-guide-2016.

[63] The EITI countries that have not undertaken the validation assessment include Argentina, the Central African Republic, Guatemala, Guyana, Honduras, Mexico, Niger, and the Netherlands.

is based on the EITI's website visitors. A lack of internet access may be an obvious reason why some people do not access the information on its website. Accordingly, the data includes information on the percentage of the population using the internet in each country (**Internet**). The data derives from the International Telecommunication Union (ITU) ICT indicators database. Table 14 presents descriptive statistics for each variable in the dataset compiled for the cross-country analysis, and Table 15 provides a summary of the various other types of hypotheses also considered below.

Table 14. Table of variable descriptive statistics for annual cross-country data (2019)

Variables	Obs.	Mean	Std. Dev.	Min	Max
Log of users pc	205	-10.093	1.373	-13.743	-6.548
EITI	205	.258	.438	0	1
EITI (supporter)	205	.068	.252	0	1
EITI (time)	205	2.282	4.085	0	12
EITI (Meaningful)	205	.175	.381	0	1
EITI (Satisfactory)	205	.043	.205	0	1
Internet	204	55.880	30.263	0	99.701
Education	188	83.516	29.245	5.932	155.961
Mineral Dependence	173	3.987	9.015	0	45.239
Control of Corruption	195	-.019	1.003	-1.773	2.170
Voice & Accountability	192	-.019	.977	-2.131	1.686
Ethnic Frac.	151	0.461	0.249	0.019	0.889
Log GDP pc	180	8.704	1.448	5.337	11.617
Openness	155	91.602	55.050	16.668	381.516
ODA	205	3.230	6.684	0	55.842

H4. Education is positively related to user numbers.

Education may be another important factor determining the demand for information. The technical nature of the disclosed information may render it incomprehensible or difficult to understand to people with relatively low reading and

numeric literacy levels (McDevitt, 2017). Previous studies by Piotrowski and Van Ryzin (2007) and Brunnschweiler et al. (2021) also indicate that education appears to be an important factor determining individuals' information-seeking activity. To capture this potential issue in the analysis, information from the World Development Indicators on each country's secondary school enrolment (% gross) is included in the dataset (**Education**).[64]

Table 15 Summary of different types of hypotheses concerning the geographical distribution of users per capita.

Hypothesis	Description (related variables)
H2	Predicts EITI participation is positively related to user numbers (EITI, EITI Time, EITI meaningful, EITI satisfaction).
H3	Considers a lack of internet access may explain why some people do not access the EITI's website (internet diffusion).
H4	Expects that the technical nature of the disclosed information may reduce demand for information as it renders it incomprehensible or difficult to understand to people with relatively low reading and numeric literacy levels (education).
H5-H7	Represents risk factors that are expected to be associated with both the resource curse and drive demand for information about the extractive sector (mineral dependence, control of corruption, voice and accountability, fractionalisation).
H8	Consists of broader economic contextual factors that may increase the importance placed in the EITI scheme and the information it disseminates (Log GDP pc, Openness, ODA).

H5. Mineral dependency is positively related to user numbers.

The relative economic importance of the natural resource sector to an economy may also be related to the amount of public interest in the EITI scheme. The initiative naturally appeals to, and targets, countries with greater economic interests in the

[64] Other education variables were also considered in further analysis, such as literacy rates and other education enrolment rates. Secondary rates are elected for inclusion in the main analysis because it appeared most clearly correlated with the outcome variable and data is available for a larger range of countries than variables such as literacy rates. Alternative specifications are available from the authors.

sector. Also, in countries where the resource sector plays a more important role in the overall economy, public interest in these issues may be heightened.

The latter of these points also relates to the previous discussion for H1. Mineral dependence may be reflected in citizens' expectations about the economic returns of the sector, which could increase public demand for information about the sector and how its wealth is being managed and distributed (Collier, 2017; Fenton Villar, 2021b). Previous findings by Brunnschweiler et al. (2021) suggest that interest in information on the extractive sector is positively correlated with the presence of extractive activity. To further investigate this claim, data on the relative economic size of natural resource rents as a proportion of GDP (**Mineral Dependence**) is compiled for each country from the World Development Indicators database.

H6. Countries with challenged institutional environments are expected to observe higher user numbers.

Similarly, economies with traditionally weak institutions and a high risk of corruption are expected to generate the greatest amount of interest in the EITI. This also reflects the expected beneficiaries of the EITI scheme, which has historically targeted countries with challenged institutional environments. Here, data on variables for both the perceived level of corruption and accountability have been assembled. The Control of Corruption Index (**Control of Corruption**) measures the extent to which public power is exercised for private gain. Its index ranges between -2.5 and 2.5 (lower scores represent higher levels of perceived corruption) and derives from the World Governance Indicators database. Meanwhile, the Voice and Accountability Index (**Voice & Accountability**) measures perceptions of the extent to which a country's citizens can participate in selecting their government, as well as the degree of freedom

of expression, freedom of association, and a free media. The index for the accountability measure also ranges between -2.5 and 2.5, and it too derives from the World Governance Indicators database (higher scores represent higher levels of accountability).

Of course, some arguments refute the hypothesis stated above. For example, some argue that the provision of information without appropriate means of deliberation and accountability may be insufficient to combat the resource curse (e.g. Kolstad and Wiig, 2009); that is, if accountability is low in a society, demand for information is likely to be lower as well. This might be explained by a degree of apathy toward the issues presented by the EITI, reflecting the feeling that, regardless of knowledge or concern for the management of natural resources, very little can be done to influence the political process governing it. Overall, a lack of accountability may simply create a degree of disinterest in society.

H7. Ethnic fractionalisation is positively related to user numbers.

Studying countries' adoption of the EITI, Pitlik et al. (2010) explain that polarized debate and political conflict over resource rents is often more intense in countries with a higher number of rival ethnic groups. They suggest that demand for information may, therefore, be higher in countries with highly fractionalised societies – for example, because it may allow opposition groups to scrutinise the public record of the government in greater detail. The data for ethnic fractionalisation derives from Drazanova's (2020) estimates of the percentage of ethnic groups in each country. The measure provided reflects the likelihood that two people chosen at random within a given country will be from different ethnic groups. The ethnic fractionalisation index ranges from 0 to 1. A score of 0 indicates there is no ethnic fractionalisation and that

all individuals are members of the same ethnic group. A score of 1 indicates that each individual belongs to their own ethnic group (**Ethnic Frac.**).

H8. Interest in the EITI will be higher in less wealthy, more aid-dependent and open economies.

Finally, the EITI has generally targeted, and drawn attention from, less wealthy nations with a greater dependence on foreign aid that are also more outward-looking or internationally inclined. For example, Öge (2016) posits that complying with the EITI's standards may enable governments to reassure the international community by showing that they can comply with global norms. The increased importance placed on the EITI scheme in these countries may well draw more general interest to the initiative and the information it disseminates. To look at these issues, the dataset is also complemented with a variable of the log of countries' GDP per capita (**Log GDP pc**). Aid dependence is measured using net official development assistance as a percentage of GDP (**ODA**), and an economy's openness is taken as international trade as a percentage of GDP (**Openness**). The source of the data for each of these variables is the World Development Indicators database.

5.3 Empirical analysis

Global time-series analysis

The first part of this empirical analysis is dedicated to investigating whether global monthly demand for information from the EITI follows secular patterns in global mineral prices. It employs a Granger causality analysis to test whether recent changes in mineral prices explain the current demand for information from the EITI. To further explain this approach, a Granger causality test is designed to detect causal

direction between two time series (Granger, 1969). The basic principle of Granger causality analysis is to test whether past values of a variable *X* explain the current values of another variable *Y*. In practice, the Granger causality test is implemented by fitting vector autoregressive (VAR) models. Granger causality is said to be established when the coefficients of the lagged values of a variable *X* are found to be jointly statistically significant in predicting *Y*, over and above what the lagged values of *Y* can predict alone. The general application of this VAR approach is described by Sims (1980). Represented in an equation, in this study we model the following process:

$$\Delta y_{mc} = \alpha_y + \beta_{yy}\Delta y_{cm-1} + \ldots + \beta_{yyp}\Delta y_{cm-p} + \beta_{yx1}\Delta x_{cm-1} + \ldots + \beta_{yxp}\Delta x_{cm-p} + \tau_m + \lambda_c + \varepsilon_{cm}^{y}$$

$$\Delta x_{mc} = \alpha_x + \beta_{xy1}\Delta y_{cm-1} + \ldots + \beta_{xyp}\Delta y_{cm-p} + \beta_{xx1}\Delta x_{cm-1} + \ldots + \beta_{xxp}\Delta x_{cm-p} + \tau_m + \lambda_c + \varepsilon_{cm}^{x}$$

Where Y is the Log of users variable in month m of calendar year c and X is the corresponding value for the Log of mineral prices variable. We adopt the subscript convention that β_{xyp} represents the coefficient of Y in the equation for X at lag p. Similarly, β_{yxp} is the coefficient of X in the equation for Y at lag p (and so on). The parameter α is the model Intercept. τ_m, λ_c and ε_{cm} are the month and year specific, as well as the variable components of the error term.

The number of lags included in the model is identified using common statistics, the Akaike information criterion (AIC) and the Schwarz information criterion (SBIC), which indicate that the optimum number of lags (p) is 2 in this instance (interested readers may refer to Stock and Watson (2011) for a detailed description of these standard information criteria). The selection of lags should also ensure that there is no autocorrelation in the residuals. We examine this issue using a Lagrange multiplier test for autocorrelation in the residuals of VAR models presented by Johansen (1995).

The results of the Lagrange multiplier test (shown in Appendix E.3) indicate no autocorrelation in the model residuals and that the lag selection is appropriate.

To avoid a spurious regression caused by non-stationarity, the variables also enter into the equation using their first differences (denoted by Δ in the equation above). Unit root tests confirm that the first differenced time-series is stationary before applying the Granger causality test. Appendix E.4 reports the results of these unit root tests using the Augmented Dicky–Fuller (ADF) test.[65] Furthermore, Engle and Granger (1987) demonstrated that a VAR in differences will be mis-specified if the variables are cointegrated; that is, the differenced system would no longer have a multivariate time-series representation with an invertible moving average. Thus, it is necessary to determine whether the non-stationary level variables share common stochastic trends before employing VAR techniques. For this purpose, the Johansen (1995) maximum likelihood rank test assesses the long-run equilibrium relationship between the variables. Appendix E.5 presents the results of this test reporting Johansen's trace statistic, which indicate that the variables are not cointegrated and that the VAR procedure is appropriate.

Table 16. Granger causality Wald test results (Jan 2017 – Dec 2020)

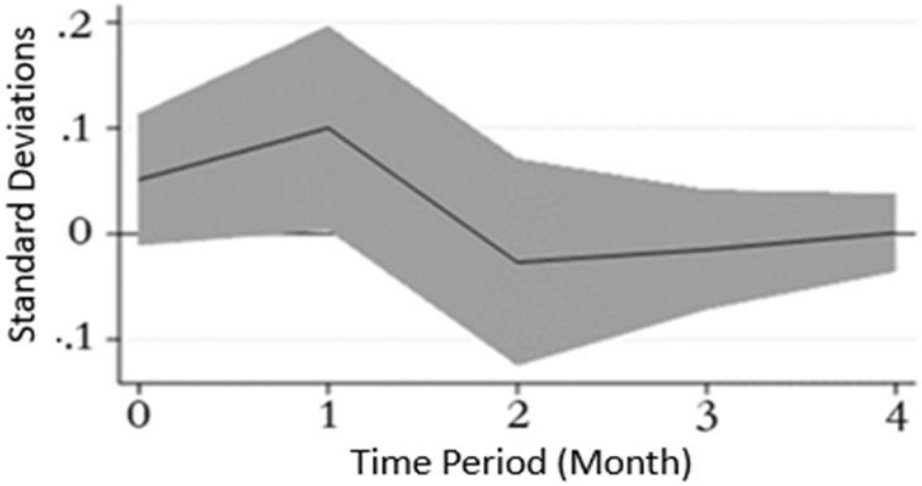
Null Hypothesis	F-statistic	P-value	Test result
Δ Log of mineral prices does not Granger cause Δ Log of users	5.045	0.014	Reject null
Δ Log of Users does not Granger cause Δ Log of mineral prices	1.929	0.165	Do not reject null

A Wald test conventionally examines whether the Granger causality runs from X to Y (and vice versa). The null hypothesis for the test is $H_0 = \beta yxp = 0$. If H_0 is rejected (i.e. at least one of $\beta yxp's$ is not equal to zero), then it suggests that the past

[65] The Phillips-Perron test, which is robust to the presence of serial correlation and time-dependent heteroscedasticity, was also performed and confirmed these findings (these results are omitted for brevity).

values of *X* contain predictive power for the current value of *Y*, which means that *X* Granger causes *Y*. Table 19 reports the results of the Wald test. The f-statistic results for the model regressing *Y* on the past values of *X* and *Y* show that we may reject this null hypothesis. In other words, the *f*-statistic results show that the Log of mineral prices Granger causes the Log of users; the second set of results show that the opposite cannot be said. The null hypothesis of the Wald test is not rejected for the model regressing *X* on the past values of *X* and *Y*, which implies that the Log of users does not Granger cause the Log of mineral prices.

Figure 5. Graph of estimated orthogonalized Impulse Response Function of change in Log Mineral Prices (impulse variable) on change in Log Users (response variable)



Note: Estimates reflect the effects of a 1-standard deviation increase in the impulse variable (change of log mineral prices) on the response variable (change of log users). Grey shaded area shows the estimates 95% Confidence Intervals.

Overall, these results support our first hypothesis (**H1**) that mineral prices are positively related to fluctuations in the global number of users. Figure 5 further depicts the results of the estimated orthogonalized impulse response functions (IRFs) for the users variable given a standard deviation increase in mineral prices.[66] The estimates

[66] For IRFs to be computed, the VAR must be stable. This implies that the effect of a shock from an impulse variable to a response variable will diminish over time towards 0. Note that, while a stable VAR is stationary, an unstable process can also be stationary. Appendix 6 reports the additional results of the VAR's stability test. This test simply requires all the eigenvalues of the companion matrix lie inside the unit circle (this matrix is a simple

show that during the period (month) following a standard deviation increase in mineral prices (i.e. log price chg = 0.04), the change in the log of users increases by approximately 0.1 standard deviations (log of users increases by 0.028).

To consider this estimate further, the large change in log mineral prices between April 2020 and December 2020 was approximately 10.47 standard deviations (log price chg = 0.419). Simulating a mineral price increase of this magnitude implies a 0.293 increase in the log of the number of users. In other words, of the 26,207-user increase between April and December 2020, the point estimate indicates that changes in mineral prices may explain approximately 5,664 of that increase (or 22% of the actual increase observed). However, this shock does not appear to continue to have a significant effect on changes in users beyond the period immediately following the shock; the estimates in Figure 5 diminish to 0 by the second period (month) following the shock.

Cross-country regression analysis

In the second part of this empirical analysis, we further examine the distribution of demand for information from the EITI across the globe. Here we explore factors associated with the cross-country variation in the number of users per capita. This part of the analysis intends to further distinguish the characteristics of the

way to express any higher-order polynomial with lag operators as a first-order polynomial) (see Hamilton 1994 for an explanation and proof of this statement). Appendix 6 plots the eigenvalues in polar coordinates; that is the real part of the eigenvalues (horizontal axis) and the imaginary part (vertical axis). The results indicate the VAR is stable as the points on the graph are far away from (inside) the outer limit of the unit circle (depicted by the black line). This indicates shocks to the VAR model die out quickly. A simple IRF also has the limitation that they give the effect over time of a one-time increase to the impulse variable, holding all else constant. This omits the possibility that shocks can be contemporaneously correlated. Hence the orthogonalized IRF using the Cholesky's decomposition approach is preferred (see Sims, 1980). The recursive ordering applied in the the Cholesky decomposition in this analysis orders mineral prices first followed by the users variable. However, the ordering makes little substantive difference to qualitative conclusions reported.

countries where we observe the greater (or lesser) demand for information. For this purpose, an OLS regression with the following specification is estimated:

$$Log\ of\ users\ per\ capita_i = \beta_0 + \beta_1 EITI_i + \beta_2 X_i + \varepsilon_i$$

Where Log of users per capita is the per-capita user outcome variable for 2019 in country i. EITI indicates whether country i is a member of the EITI. X represents the vector of further variables related to each of the hypotheses discussed above (H3–H8). This includes factors such as internet diffusion, education, mineral dependence, corruption, accountability, ethnic fractionalisation, GDP per capita, trade openness, and aid dependency. The parameters β_0, β_1, β_2, and ε are the intercept, the coefficients of corresponding variables, and the error term, respectively.

Table 20 presents the results from this cross-country regression analysis. To aid in the interpretation of our results, all of the continuous variables in the analysis (i.e. exc. EITI variables) have been normalised by dividing the difference between each country's value and the variable mean by its standard deviation. As an initial look at **H2**, Column 1 provides the results of a parsimonious specification including only the binary EITI variable indicating whether a country is a member of the EITI. The results show, as we predicted, that demand for information from the EITI is significantly higher for countries that are members of the EITI. The coefficient in Column 1 indicates that the number of users is 0.614 standard deviations higher in EITI countries. According to Cohen's (1988) U3 index, this is equivalent to 73% of EITI countries reporting a higher number of users than the simulated control group average (i.e. it corresponds to a 23% relative increase).[67] The coefficient remains statistically

[67] Cohen's U3 index involves a transformation that simulates two perfectly overlapping standard normal curves (one for the treatment group and one for the control group) to illustrate the magnitude of the estimated effect. The approach involves comparing the proportion of area under the normal curve given the standard deviation shift in means inferred by the estimated effect, and interpreting this in terms of percentiles. For example, if there was no effect, the 0 standard deviation difference between the means of the treatment and control group indicates 50% of

significant even following the inclusion of additional control variables in Columns 2–6.

Table 17. Cross-country OLS regressions on the log of the number of users per capita (2019)

	(1) Log of users pc	(2) Log of users pc	(3) Log of users pc	(4) Log of users pc	(5) Log of users pc	(6) Log of users pc
EITI	0.614***	0.960***	0.891***	0.823***	1.017***	0.777***
	(0.148)	(0.156)	(0.157)	(0.144)	(0.137)	(0.153)
Internet		0.435***				0.186
		(0.064)				(0.168)
Education			0.392***			-0.068
			(0.063)			(0.118)
Min. Dep.				0.133***		0.183***
				(0.051)		(0.066)
Corruption				0.370***		0.315***
				(0.094)		(0.106)
Accountability				0.354***		0.410***
				(0.096)		(0.098)
Ethnic Frac.				0.064		0.061
				(0.071)		(0.074)
Log GDP pc					0.644***	-0.090
					(0.083)	(0.196)
Openness					0.181***	0.251***
					(0.054)	(0.069)
Aid					0.376***	0.136
					(0.141)	(0.126)
Constant	-0.159**	-0.258***	-0.247***	-0.320***	-0.509***	-0.381***
	(0.080)	(0.076)	(0.082)	(0.073)	(0.093)	(0.089)
Observations	205	204	188	140	154	120
R-squared	0.073	0.240	0.215	0.511	0.466	0.597

Robust standard errors are in parentheses. Superscripts *, **, *** correspond with a 10, 5 and 1% level of significance. Variables have been normalised (exc. EITI) by dividing the difference between each country's value and the variable mean by its standard deviation.

The results in Columns 2–6 in Table 20 provide the estimates from the specifications including additional control variables. Columns 2–5 provide the simple

members in the treatment group (e.g. the EITI group) would score higher than the mean of the control group (and 50% of members in the treatment group would score lower than the control group mean).

specifications, first examining the relationship between user numbers and internet diffusion (Col. 2) and then education (Col. 3). Following this, the results consider the variables related to the risk factors determining the resource curse and demand for information about the extractive sector (e.g. resource dependence, quality of institutions, fractionalisation) (Col. 4) followed by broader economic factors (Col 5). Column 6 reports the specification, including all of these different factors in one regression model.

Starting with the results in Columns 2 and 3, the coefficient for the Internet variable indicates that the degree of internet use in society is positively related to the number of users. This finding supports hypothesis **H3**. The statistically significant coefficient indicates that one standard deviation increase in the proportion of the population using the internet corresponds with an increase of approximately 0.435 standard deviations in the log of user numbers. Similarly, the findings from Column 3 also confirm the hypothesis that education is positively related to the number of users discussed in **H4**. Again, the positive coefficient for the education variable indicates that one standard deviation increase in school enrolment corresponds to a 0.392 standard deviation increase in the log of the number of users per capita.

Column 4 further examines the hypothesis that mineral dependency is positively correlated with user numbers (**H5**) and that interest is likely to occur among countries with challenged institutional environments and a high risk of corruption (**H6**). The results indicate that mineral dependency does indeed appear to be positively correlated with the number of users, indicating that the economic importance of the extractives sector is related to interest in the EITI and the content it discloses. The significant positive coefficient for the mineral dependency variable

indicates that one standard deviation in mineral dependency corresponds to a 0.133 standard deviation increase in the log of the number of users per capita.

The coefficients for the corruption and accountability variables, however, do not confirm the hypothesis that interest is likely to occur in countries with challenged institutional environments. The positive coefficient for the corruption variable indicates that one standard deviation improvement in corruption scores (i.e. reduction in perceived levels of corruption) is related to a 0.370 standard deviation increase in the log of users per capita. Similarly, one standard deviation improvement in the voice and accountability index corresponds with a 0.354 standard deviation increase in the log of user numbers. This could be explained by a degree of apathy toward the issues presented by the EITI in countries with weak governance structures and may point to the important role of social and political deliberation surrounding these types of transparency initiatives.

Column 4 also includes the Ethnic Fractionalisation variable, which concerns the hypothesis that the presence of different ethnic groups may create interest in the EITI as they compete for access to this wealth and provides a means to scrutinise the public record of the governing in greater detail (**H7**). The results do not support this hypothesis, as the coefficient is statistically insignificant. Note that the inclusion and exclusion of the other control variables in the dataset do not change this finding. It may not be the rivalry caused by ethnic diversity that creates demand for public scrutiny, but rather the broader institutional environment governing society itself.

An alternative specification explored substituting the Ethnic Fractionalisation variable with the World Bank's Political Stability and Absence of Violence Index as a means of measuring political conflict between rivalling groups (see Appendix E.7). The results indicate that greater stability and a lower likelihood of political violence is

positively correlated with log users per capita. This reflects the high correlation between political violence and other institutional factors (also explaining why the control of corruption variables loses significance in these specifications). Note that this detected correlation remains consistent even when we remove the accountability and control of corruption variables. This finding corresponds with the above discussion indicating that apathy toward the EITI may arise in countries with weak institutional settings.

The results in Column 5 further consider that the EITI scheme may well draw more interest among countries that place greater emphasis on it. In particular, the EITI has generally drawn attention from less wealthy nations with a greater dependence on foreign aid that are also more outward-looking or internationally inclined (**H8**). Interestingly, these results also indicate that the number of users is positively related to both the openness of an economy to international trade and dependency on foreign aid. The estimated coefficients show that one standard deviation increase in each of these respective factors corresponds with 0.181 and 0.376 standard deviation increases, respectively, in the log of the number of users per capita. However, the results do not indicate that greater interest accrued in less wealthy nations. On the contrary, the coefficient for the log GDP per capita variable is both significant and positive, and it suggests that a standard deviation increase in the log of GDP per capita corresponds with a 0.644 standard deviation increase in the log number of users.

This may be explained in part by the positive relationship between GDP per capita and the strength of institutions. For instance, taken together in a single specification in Column 6, the results show that the coefficient for the GDP per capita becomes statistically insignificant (and the sign turns negative). Note that the

coefficient would also be insignificant if we had included the Log GDP pc in a more parsimonious specification with only the corruption and accountability variables. More generally, the results in Column 6 highlight that, although the findings show that user numbers are larger in more affluent and educated economies with better access to the internet, this is also because these same economies have stronger institutions that are positively related to the number of users. However, even after controlling for the levels of corruption and accountability in each country, we still find that the number of users is positively related to EITI membership, mineral dependency and openness (as predicted).[68]

Table 21 presents further specifications that explore adding other types of EITI variables to the regression analysis. This extends our evaluation of **H2** and includes a variable for whether a country is an EITI-supporting country. It also captures a discrete measure of EITI membership (instead of a binary one) indicating the length of time a country has been a member of the initiative. This considers whether the number of users is positively correlated with the maturity of the implementation of the initiative. As an alternative, it also uses the outcomes of the EITI validation assessment as a measure of a country's progress in implementing the initiative's standards.

The results indicate that demand for information from the EITI is higher among countries that are bilateral supporters of the scheme. For example, in Column 1 of Table 21, the positive coefficient estimates that the log of the number of users per capita is more than 1 standard deviation higher in bilateral EITI-supporting countries than non-supporting ones. This suggests that engagement with countries other than through direct membership may also be an important factor determining the demand

[68] Appendix E.8 provides the results of the specifications in Table 5 when the sample is limited to the 120 countries from Column 6 in Table 5. The findings from the results in Appendix E.8 remain qualitatively the same and consistent with the main results reported above.

for information from the EITI. Including the other control variables weakens the estimated relationship between the EITI support variable and the number of users, but the positive relationship appears to remain weakly significant at a 10% confidence level (e.g. Columns 5 and 6). Interestingly, in the richer specification in the table, the coefficients of the EITI membership variables are also much larger than the EITI supporter variable. This suggests EITI membership has a stronger relationship with the number of users than simply being a bilateral supporter (thus, country membership in the EITI should also be encouraged among its supporters).

Table 18. Cross-country OLS regressions on the log of the number of users per capita (2019) using alternative EITI variables

	(1) Log of users pc	(2) Log of users pc	(3) Log of users pc	(4) Log of users pc	(5) Log of users pc	(6) Log of users pc
EITI	0.604***			0.733***		
	(0.143)			(0.156)		
EITI (supporter)	1.034***	1.091***	1.004***	0.380	0.382*	0.427*
	(0.180)	(0.173)	(0.190)	(0.242)	(0.213)	(0.248)
EITI (time)		0.051***			0.093***	
		(0.014)			(0.013)	
EITI (Meaningful)			0.580***			0.738***
			(0.163)			(0.172)
EITI (Satisfactory)			0.948***			1.026***
			(0.283)			(0.296)
Internet				0.231	0.254	0.213
				(0.173)	(0.163)	(0.168)
Education				-0.080	-0.070	-0.033
				(0.120)	(0.105)	(0.119)
Min. Dep.				0.181***	0.122**	0.140**
				(0.066)	(0.057)	(0.070)
Corruption				0.249**	0.251**	0.164*
				(0.111)	(0.103)	(0.096)
Accountability				0.408***	0.413***	0.369***
				(0.099)	(0.098)	(0.102)
Ethnic Frac.				0.065	0.048	0.083
				(0.075)	(0.073)	(0.074)
Log GDP pc				-0.160	-0.151	-0.012
				(0.195)	(0.189)	(0.200)
Openness				0.285***	0.267***	0.301***
				(0.067)	(0.063)	(0.065)
Aid				0.108	0.089	0.309
				(0.125)	(0.130)	(0.129)

Constant	-0.227***	-0.190**	-0.225***	-0.394***	-0.414***	-0.470***
	(0.080)	(0.081)	(0.081)	(0.090)	(0.087)	(0.092)
Observations	205	205	197	120	120	113
R-squared	0.141	0.113	0.148	0.604	0.637	0.628

Robust standard errors are in parentheses. Superscripts *, **, *** correspond with a 10, 5 and 1% level of significance. Variables have been normalised (exc. EITI, EITI (Meaningful), EITI (Satisfactory) and EITI (Time)) by dividing the difference between each country's value and the variable mean by its standard deviation.

The results presented in Table 21 also show that the number of users is positively related to the maturity of a country's membership. The specification in Column 2 of Table 21 indicates that an additional year of membership in the EITI corresponds with a 0.051 standard deviation increase in the log of the number of users per capita. This estimate increases to 0.093 standard deviations when we also include other control variables (Column 5). Using the EITI validation assessment as a measure of a country's maturity in the scheme validates this finding. Furthermore, the estimated coefficient grows with the maturity of a country. For example, in Column 3, being validated as having made 'meaningful progress' is related to an increase of approximately 0.580 standard deviations in the log of user numbers. Meanwhile, countries validated with a better score (i.e. those having made 'satisfactory progress'), are associated with a 0.948 standard deviation increase.

5.4 Conclusion

Although it is assumed that transparency initiatives in the extractive industries can generate and sustain public demand for information about the sector, very little is currently known about the demand for information, despite concerted efforts to enhance transparency in the extractives sector or about the factors that are related to the variation in demand for information. Using a new dataset on global demand for information from the number of users accessing the website of the sector's flagship international transparency scheme, the Extractive Industries Transparency Initiative

(EITI), this study examined the demand for information both through time and across different countries.

Building on a growing body of research examining the temporal patterns and fluctuations in public interest in policy issues, the first part of the empirical analysis examined the relationship between monthly changes in global mineral prices and aggregate global demand for information from the EITI. The data indicates that demand for information from the EITI has been rising in recent years, yet it also shows that aggregate demand for information follows secular patterns in global mineral prices. Overall, these findings highlight the potential susceptibility of the initiative to trends in public policy interests.

The policy implications of these findings are significant. These results are presented amid intensifying policy discussions surrounding the heightened corruption risks that arise during market downturns – and upturns – in the extractive sector. For example, whereas commodity market upturns are related to increased risks caused by the increasing value of resource rents, market downturns are also associated with heightened risks because companies are tempted to 'cut corners' to reduce operating costs and decrease non-revenue generating activities (such as anti-corruption measures involving project monitoring, third-party due diligence and public reporting) (e.g. Gillies, 2020). These implications further highlight the need to increase public education and find strategies to build awareness of these issues to stabilise public interest through the commodity cycle. This may also help to ensure more consistent and sustained policy support from the industries' stakeholders for transparency initiatives such as the EITI (an issue previously raised by Rich, 2016).

In the second part of the empirical analysis, cross-country regressions show that demand for information from the EITI is positively correlated with a country's

dependence on resource rents and their EITI membership status. In particular, the length of time a country has been a member of the EITI and their progress in implementing the initiative's standards is related to high user numbers accessing the EITI website. Furthermore, demand for information appears to be higher among wealthier, more open economies with lower perceived levels of corruption as well as higher levels of accountability and freedom of expression. The latter of these findings contrasts with the study's original hypothesis and the expected beneficiaries of the EITI scheme. These results point to the need for improved communication and engagement strategies that target countries with weaker and currently challenged institutional settings.

Taken together, the policy implications of our results highlight the need for enhanced communication strategies to stabilise public interest through the commodity cycle and increase demand in institutionally challenged contexts. This also presents an interesting avenue for future research; further investigation of different strategies and approaches available to improve or sustain demand appear to offer an essential route to help develop transparency policies in the extractive industries. Experimenting with various activities such as public campaigns and convening public education events provides one possible avenue. Colombia provides an interesting example in this regard, having previously launched an online training platform providing information about the extractive industries and explaining how citizens can participate in accountability processes. However, this type of policy innovation has not yet undergone a rigorous evaluation of its influence or impact on the sector's various stakeholders.

Another contentious issue (or complication) that warrants further empirical research is whether enhanced engagement strategies will be adequate to generate

heightened levels of public interest in contexts with low accountability. There is also a need for further research seeking to better understand public demand for information tools and transparency in other related sectors with similar problems. For example, Anseeuw et al. (2013) offer an edifying discussion on their experience creating a public tool to assess and promote transparency in global land deals.

Chapter 6.

Conclusion

'Rich parents sometimes spoil their kids.
Mother Nature is no exception'

Gylfason (2001)

This thesis is devoted to contributing to our understanding of the societal impacts of the extractive sector, as well as the role of the recent policy trend towards implementing transparency and accountability standards to help combat the sector's mismanagement. The introduction of this thesis reviewed some of the key economic arguments underlying extractive-led development and highlighted the reasons for the heightened interest currently being shown in them. This discussion highlighted the economic opportunities that could be generated from the extraction of minerals. In particular, the revenues from extraction could be used to invest in the development of the economy or even help to provide better social security, services, and infrastructure. In recent years, the prospect of such windfalls has led researchers to speculate about whether this development imperative may inflate citizens' economic expectations and, due to an upward shift in aspirations, thereby cause a degree of dissatisfaction. Using survey data from 18 Latin American countries, the first empirical chapter (Chapter 2) contributes a novel econometric analysis studying this hypothesis. It documents the presence of a 'euphoric' relationship between the mineral sector and citizens' economic expectations, but it does not detect a significant relationship with citizens' reported life satisfaction.

However, despite the economic rhetoric surrounding extraction, a great deal of empirical evidence and theory also points to the difficult challenges imposed by the externalities of extraction. Alongside explanations indicating the crowding-out effects of the sector, the rent-seeking that tends to proliferate around the sector also poses other issues such as nepotism, patronage and corruption. This has caused researchers to question the net effects of the sector, as highlighted by the expansive literature devoted to the resource curse hypothesis. Whether mother nature has inadvertently cursed some of her most well-endowed children with the externalities associated with

mining is a point that remains vigorously debated. Nonetheless, the challenges surrounding the governance of the sector remain policy-relevant and widely accepted.

In recent years, the international community has increasingly turned to the creation of 'good governance standards' in transparency and accountability as a means to help institutionally challenged countries govern their rich endowments of natural capital. In this vein, the second empirical chapter (Chapter 3) further examined the role of the hallmark transparency scheme in the extractive sector: the Extractive Industries Transparency Initiative (EITI). Here it was concluded that the EITI is not a policy panacea that will eradicate corruption in the extractive industries. Discussions on the implementation of the scheme make it clear that the EITI must find ways to continue improving its stringency and outreach, as the final empirical chapter (of which more below) also suggests.

Nevertheless, although discontent has grown among many in the extractives sector about the EITI, deficiencies in the initiative do not mean that it cannot act as an 'entry point' to help stimulate changes in public governance and, with this, evolve with the maturity of its members (setting a steady pace for international progression if you like). For example, the disclosure of beneficial ownership information was once difficult to fathom, but today, a new generation of EITI standards introduced in 2016 is now encouraging and normalising such issues among its members.

Discontent among critics of the EITI has largely been supported by evidence indicating a relative lack of progress among its members on improving corruption indicators. Contrary to the findings of many leading studies, using a 'state of the art' indicator called the Bayesian Corruption Indicator (BCI) and an innovative estimation strategy combining entropy balancing with a difference-in-difference framework to address the baseline inequalities that exist between member and non-member

countries, the second empirical chapter (Chapter 3) finds that corruption scores have improved significantly among EITI member countries. Similarly, using a novel instrument exploiting the variation in neighbouring countries' EITI participation to control for the endogenous nature of one's own EITI involvement, the third empirical chapter (Chapter 4) indicates that a positive relationship exists between countries' EITI membership and trust in politicians.

Overall, this study contributes to the now-growing evidence highlighting the apparent sensitivity of findings in studies on the EITI. It appears that the results may be sensitive to the corruption measure used, the definition of the EITI group or the estimator applied (findings that have recently been – at least in part – supported by evidence from Sovacool, 2020). Nevertheless, although methodological challenges and limitations inevitably exist with the comparison of country outcomes, such studies can also offer important insights into suggestive empirical regularities in EITI countries that may be used to inform other forms of explorative research and hypotheses. For example, Chapter 4 highlights the limitations of existing evidence on transparency and multi-stakeholder initiatives, which is based on short-lived interventions. The discussion encourages further study into the dynamics of the effects of these interventions on trust by implying that the effects may accumulate only over time or with consistent signals of intent.

Using a new dataset on visitors to the EITI website, the final empirical chapter (Chapter 5) provides a rare exploratory analysis examining patterns of demand for information from a transparency scheme. It finds that aggregate global demand for information follows secular patterns in global mineral prices, thereby highlighting the potential susceptibility of the EITI to trends in the public's policy interests. Cross-country regressions also show that demand for information appears to be higher

among wealthier, more open economies with lower perceived levels of corruption and higher levels of accountability. This contrasts with the expected beneficiaries of the EITI scheme. Overall, this supports the points made in the preceding chapters about the EITI and the need to ensure the EITI's information reaches stakeholders with weaker and more challenging institutional settings (because they also appear least likely to access the information available on the EITI website).

In many respects, this thesis has provided only an initial line of enquiry into the issues it has addressed; as such, opportunities for further research are abundant. The discussion has identified various data limitations. In the empirical analysis of expectations (Chapter 2), for instance, the discussion recognises that the outcome data conveys people's responses about their outlook for the next 12 months. The analysis also lacked evidence on aspirations or even alternative measures of life satisfaction; it would be interesting to better understand whether preferences for economic and environmental prioritization change when the economic opportunities from mining become more abundant. Alternatively, the possible links this broader theory on extraction, expectations and policy preferences remains relatively unexplored.

Beyond the desire for improved sector-specific corruption indicators, Chapter 3 also raised important questions about whether we should expect that actual or perception-based corruption measures will be more responsive to transparency initiatives. Adequate macro-data was not available but this may be an interesting issue to explore in a controlled environment at a more localized scale. Similarly, the chapter on the EITI and trust (Chapter 4) highlighted ambiguous differences between the results from experiments using surveys and trust games. Again, this was not an issue explored, as trust data was solely derived from surveys in this thesis. It would also have

been interesting to compare the results with individual-level trust data rather than country-averaged data, but this was not available.

Meanwhile, the final empirical chapter (Chapter 5) discussed the need for greater experimentation with communication strategies suited to helping stimulate demand for information in challenging institutional environments. Very little formal experimentation has been conducted to understand how such different educational content and promotion strategies could support the EITI or how they could increase demand among different types of EITI stakeholders (e.g. local, regional, national, and international). Such revelations would constitute a valuable contribution to this line of research, as would research providing insights into how the recent package of changes to the EITI's standards and verification process affects members experience and implementation of the EITI.

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Appendix A

Appendix A.1 List of journals searched

- American Economic Journal: Applied Economics
- American Economic Journal: Economic Policy
- American Economic Journal: Macroeconomics
- American Economic Journal: Microeconomics
- American Economic Review: Insights
- American Journal of Agricultural Economics
- Econometric Theory
- Econometrica
- Economic Theory
- Energy Economics
- European Economic Review
- Experimental Economics
- Games and Economic Behavior
- Health Economics
- International Economic Review
- Journal of Applied Econometrics
- Journal of Business & Economic Statistics
- Journal of Development Economics
- Journal of Econometrics
- Journal of Economic Behavior and Organization
- Journal of Economic Dynamics and Control
- Journal of Economic Growth
- Journal of Economic Literature
- Journal of Economic Perspectives
- Journal of Economic Theory
- Journal of Environmental Economics and Management
- Journal of Financial Econometrics
- Journal of Health Economics
- Journal of Human Resources
- Journal of International Economics
- Journal of Labor Economics
- Journal of Monetary Economics
- Journal of Money, Credit and Banking
- Journal of Political Economy

- Journal of Public Economics
- Journal of Risk and Uncertainty
- Journal of the European Economic Association
- Journal of Urban Economics
- Quantitative Economics
- RAND Journal of Economics
- Review of Economic Dynamics
- The American Economic Review
- The Economic Journal
- The Journal of Economic History
- The Journal of Law and Economics
- The Quarterly Journal of Economics
- The Review of Economic Studies
- The Review of Economics and Statistics
- Theoretical Economics
- Ecological Economics
- Economic Development and Cultural Change
- Environmental and Resource Economics
- Journal of Agricultural and Resource Economics
- Journal of Development Studies
- Journal of the Association of Environmental and Resource Economists
- Land Economics
- Resource and Energy Economics
- The Australian Journal of Agricultural and Resource Economics
- World Development

Appendix B

Appendix B.1 Table of variable descriptions

Variables	Description	Data Source
Economic Expectations: Country (Country Exp.)	This measures whether the respondent expects changes in the economic situation of their country in the next 12 months. The values 1, 2, 3, 4, and 5 indicate that one expects the economic situation to get "much worse", "a little worse", "stay about the same", "little better", and "much better".	Latinobarometer Database
Economic Expectations: Personal (Personal Exp.)	This measures whether the respondent expects changes in their personal economic situation in the next 12 months. The values 1, 2, 3, 4, and 5 indicate that one expects the economic situation to get "much worse", "a little worse", "stay about the same", "little better", and "much better".	Latinobarometer Database
Life Satisfaction (Life Sat.)	This measures respondent's life satisfaction. The values 1, 2, 3, and 4, indicate that they are "not satisfied at all", "not very satisfied", "fairly satisfied", and "very satisfied" with their life.	Latinobarometer Database
Sedimentary Basin	The fraction of land residing in a sedimentary basin in each country.	Cassidy (2019)
Mineral dependence (Min. dep.)	The sum of the fraction of mineral, coal, oil and natural gas rents in GDP.	World Development Indicators
Mineral abundance (Min. per capita)	The log value of the sum of per capita mineral, coal, oil and natural gas rents.	World Development Indicators
Oil dependence (Oil. dep.)	The sum of the fraction of oil and natural gas rents in GDP.	World Development Indicators
Oil abundance (Oil per capita)	The log value of the sum of per capita oil and natural gas rents.	World Development Indicators
Min. dep.*Basin	(Mineral rent dependency multiplied by Sedimentary Basin) multiplied by 100.	See variables above

Variables	Description	Data Source
Min. per capita.*Basin	Mineral rent per capita multiplied by Sedimentary Basin.	See variables above
Oil dep.*Basin	(Oil rent dependency multiplied by Sedimentary Basin) multiplied by 100.	See variables above
Oil per capita.*Basin	Oil rent per capita multiplied by Sedimentary Basin.	See variables above
Age	The reported age of the respondent (number of years old).	Latinobarometer Database
Gender (Male)	A binary variable indicating the gender of the respondent. The value 1 indicates the respondent is male, and 0 that they are female.	Latinobarometer Database
Civil Status	The reported civil status of the respondent. The value 1 indicates they are "married", 2 "single, and 3 "separated" (i.e. divorced, widowed, etc.).	Latinobarometer Database
Socioeconomic Status	The reported social status of the respondent. The values 1, 2, 3, 4, and 5 indicate the respondent reports their social status is "very bad", "bad", "not bad", "good", and "very good".	Latinobarometer Database
Education Level	The reported education level of the respondent. The values 1, 2, and 3 indicate the respondent "did not attend secondary school", "has attended secondary school", and "has attended a higher education course".	Latinobarometer Database
Log GDP pc	The Log of Real Gross Domestic Product per Capita, PPP (constant 2011 international $).	World Development Indicators
GDP Growth %	GDP per capita growth (%)	World Development Indicators
Trade Openness	International Trade (% of GDP)	

Variables	Description	Data Source
		World Development Indicators
Unemployment	Unemployment, total (% of total labor force)	World Development Indicators
Inflation	Inflation, GDP deflator (annual %)	World Development Indicators

Appendix B.2 Regressions using oil rent dependency measure

	(1) Country Exp.	**(2)** Personal Exp.	**(3)** Life Sat.
Oil Dep.*Basin	1.121***	1.058**	1.044
	(0.048)	(0.028)	(0.038)
Oil Dep.	0.343	1.835	0.214
	(0.473)	(1.660)	(0.286)
Age	0.966***	0.967***	0.965***
	(0.003)	(0.003)	(0.003)
(Age ^ 2) / 100	1.030***	1.018***	1.032***
	(0.003)	(0.003)	(0.003)
Gender (Male)	1.117***	1.037**	1.059***
	(0.017)	(0.019)	(0.017)
Observations	252,568	272,497	273,583
No. of Country's	18	18	18
Country fixed-effects	Yes	Yes	Yes
Year fixed-effects	Yes	Yes	Yes

Notes: Coefficients report estimated odds ratio. Country cluster-robust standard errors are in parentheses. Superscripts *, **, *** correspond with a 10, 5 and 1% level of significance. Coefficients for the year and country fixed effects are omitted for brevity.

Appendix B.3 Regressions using the log of oil rents per capita measure

	(1) Country Exp.	**(2)** Personal Exp.	**(3)** Life Sat.
Oil per capita*Basin	1.111	0.857	0.940
	(0.331)	(0.253)	(0.288)
Oil per capita	1.146	1.345	1.113
	(0.243)	(0.285)	(0.198)
Age	0.966***	0.967***	0.965***
	(0.003)	(0.003)	(0.003)
(Age ^ 2) / 100	1.030***	1.018***	1.032***
	(0.003)	(0.003)	(0.003)
Gender (Male)	1.117***	1.037**	1.059***
	(0.017)	(0.018)	(0.017)
Observations	252,568	272,497	273,583
No. of Country's	18	18	18
Country fixed-effects	Yes	Yes	Yes
Year fixed-effects	Yes	Yes	Yes

Notes: Coefficients report estimated odds ratio. Country cluster-robust standard errors are in parentheses. Superscripts *, **, *** correspond with a 10, 5 and 1% level of significance. Coefficients for the year and country fixed effects are omitted for brevity.

Appendix B.4 Regressions using mineral rent dependency measure and the restricted sample

	(1) Country Exp.	**(2)** Personal Exp.	**(3)** Life Sat.
Min. Dep.*Basin	1.124***	1.086**	1.046
	(0.045)	(0.037)	(0.030)
Min. Dep.	0.145	0.446	0.512
	(0.212)	(0.683)	(0.656)
Age	0.966***	0.967***	0.966***
	(0.003)	(0.004)	(0.003)
(Age ^ 2) / 100	1.030***	1.018***	1.032***
	(0.003)	(0.003)	(0.004)
Gender (Male)	1.125***	1.044**	1.086***
	(0.020)	(0.022)	(0.015)
Observations	200,878	216,628	216,814
No. of Country's	14	14	14
Country fixed-effects	Yes	Yes	Yes
Year fixed-effects	Yes	Yes	Yes

Notes: Coefficients report estimated odds ratio. Country cluster-robust standard errors are in parentheses. Superscripts *, **, *** correspond with a 10, 5 and 1% level of significance. Coefficients for the year and country fixed effects are omitted for brevity. The restricted sample excludes observations from countries with small extractive industries (inc. El Salvador, Paraguay, Panama, and Honduras).

Appendix B.5 Regressions using the log of mineral rents per capita and the restricted sample

	(1) Country Exp.	**(2)** Personal Exp.	**(3)** Life Sat.
Min. per capita*Basin	1.370	0.996	1.042
	(0.354)	(0.256)	(0.190)
Min. per capita	1.103	1.291	1.106
	(0.138)	(0.208)	(0.152)
Age	0.966***	0.967***	0.966***
	(0.003)	(0.004)	(0.003)
(Age ^ 2) / 100	1.030***	1.018***	1.032***
	(0.003)	(0.003)	(0.004)
Gender (Male)	1.125***	1.044**	1.085***
	(0.020)	(0.022)	(0.015)
Observations	200,878	216,628	216,814
No. of Country's	14	14	14
Country fixed-effects	Yes	Yes	Yes
Year fixed-effects	Yes	Yes	Yes

Notes: Coefficients report estimated odds ratio. Country cluster-robust standard errors are in parentheses. Superscripts *, **, *** correspond with a 10, 5 and 1% level of significance. Coefficients for the year and country fixed effects are omitted for brevity. The restricted sample excludes observations from countries with small extractive industries (inc. El Salvador, Paraguay, Panama, and Honduras).

Appendix B.6 Regression using mineral dependency measure and additional country-level control variables

	(1) Country Exp.	(2) Personal Exp.	(3) Life Sat.
Min. Dep.*Basin	1.098***	1.067**	1.022
	(0.026)	(0.031)	(0.018)
Min. Dep.	0.110	0.325	0.295
	(0.197)	(0.418)	(0.233)
Log GDP pc	2.016	3.070*	4.016***
	(1.229)	(1.781)	(1.086)
GDP Growth %	1.060***	1.049***	1.021***
	(0.017)	(0.017)	(0.007)
Trade Openness	1.000	0.999	1.003*
	(0.005)	(0.004)	(0.002)
Unemployment	1.018	1.013	1.031
	(0.023)	(0.023)	(0.019)
Inflation	0.999	1.004	1.004
	(0.009)	(0.008)	(0.004)
Observations	251,111	270,993	272,120
No. of Countries	18	18	18
Country fixed-effects	Yes	Yes	Yes
Year fixed-effects	Yes	Yes	Yes

Notes: Coefficients report estimated odds ratio. Country cluster-robust standard errors are in parentheses. Superscripts *, **, *** correspond with a 10, 5 and 1% level of significance. Coefficients for the individual-level control variables (inc. age, age squared, gender, civil status, education level, socioeconomic status) and year and country fixed effects are omitted for brevity. The restricted sample excludes observations from countries with small extractive industries (inc. El Salvador, Paraguay, Panama, and Honduras).

Appendix B.7 Regressions using the log of mineral rents per capita measure and additional country-level control variables

	(1) Country Exp.	**(2)** Personal Exp.	**(3)** Life Sat.
Min. per capita*Basin	1.061	0.818	1.070
	(0.214)	(0.206)	(0.161)
Min. per capita	1.185	1.347	0.996
	(0.165)	(0.420)	(0.113)
Log GDP pc	0.850	1.381	3.299***
	(0.531)	(0.703)	(0.654)
GDP Growth %	1.062***	1.052***	1.020***
	(0.016)	(0.016)	(0.007)
Trade Openness	0.999	0.998	1.003
	(0.005)	(0.004)	(0.002)
Unemployment	1.003	0.996	1.026
	(0.019)	(0.018)	(0.017)
Inflation	0.997	1.002	1.003
	(0.007)	(0.007)	(0.004)
Observations	251,111	270,993	272,120
No. of Countries	18	18	18
Country fixed-effects	Yes	Yes	Yes
Year fixed-effects	Yes	Yes	Yes

Notes: Coefficients report estimated odds ratio. Country cluster-robust standard errors are in parentheses. Superscripts *, **, *** correspond with a 10, 5 and 1% level of significance. Coefficients for the individual-level control variables (inc. age, age squared, gender, civil status, education level, socioeconomic status) and year and country fixed effects are omitted for brevity. The restricted sample excludes observations from countries with small extractive industries (inc. El Salvador, Paraguay, Panama, and Honduras).

Appendix B.8 Regressions using logged country averaged outcome data

	(1) Country Exp.	**(2)** Personal Exp.	**(3)** Life Sat.
Min. Dep.*Basin	1.022**	1.013**	1.007
	(0.008)	(0.006)	(0.004)
Min Dep.	0.661	0.861	0.867
	(0.181)	(0.215)	(0.167)
Min. per capita*Basin	1.028	0.993	1.021
	(0.044)	(0.040)	(0.025)
Min. per capita	1.024	1.036	1.003
	(0.030)	(0.027)	(0.019)
Observations	246	264	247
No. of Country's	18	18	18
Country fixed-effects	Yes	Yes	Yes
Year fixed-effects	Yes	Yes	Yes

Notes: Regressions estimated using Ordinary Least Squares (OLS). Robust standard errors are in parentheses. Superscripts *, **, *** correspond with a 10, 5 and 1% level of significance. Coefficients for the constant and year and country fixed effects are omitted for brevity.

Appendix C

Appendix C.1 List of countries in sample and EITI status

Country	Commitment	Candidacy	Compliant
Albania	2009	2009	2013
Algeria			
Angola			
Argentina			
Armenia			
Azerbaijan	2003	2007	2009
Bahrain			
Bangladesh			
Bolivia			
Botswana			
Brazil			
Burkina Faso	2007	2009	2013
Cameroon	2005	2007	2013
Chile			
China			
Colombia	2013	2014	
Congo, Dem. Rep.	2005	2007	2014
Congo, Rep.	2004	2007	2013
Costa Rica			
Cote d'Ivoire	2007	2008	2013
Croatia			
Dominican Republic	2016	2016	
Ecuador			
Egypt, Arab Rep.			
El Salvador			
Gabon	2004	2007	
Gambia, The			
Ghana	2003	2007	2010
Guatemala	2010	2011	2014
Guinea	2005	2007	2014
Guinea-Bissau			
Guyana	2010		
Haiti			
Honduras	2012	2013	
India			
Indonesia	2008	2010	2014
Iran, Islamic Rep.			
Jamaica			
Jordan			
Kazakhstan	2005	2007	2013
Kenya			
Liberia	2007	2008	2009
Madagascar	2008	2008	
Malawi	2014	2015	
Malaysia			

Country	Commitment	Candidacy	Compliant
Mali	2006	2007	2011
Mexico	2015		
Moldova			
Mongolia	2006	2007	2010
Morocco			
Myanmar	2012	2014	
Namibia			
Nicaragua			
Niger	2005	2007	2010
Nigeria	2003	2007	2011
Oman			
Pakistan			
Panama			
Papua New Guinea	2013	2014	
Paraguay			
Peru	2005	2007	2012
Philippines	2012	2013	
Saudi Arabia			
Senegal	2012	2013	
Sierra Leone	2006	2008	2014
Slovenia			
South Africa			
Sri Lanka			
Tanzania	2008	2009	2012
Thailand			
Tunisia			
Turkey			
Uganda			
Uruguay			
Venezuela, RB			
Vietnam			
Zambia	2008	2009	2012
Zimbabwe			

Appendix C.2 Table of variable descriptions

Variable	Description	Data Source
Log GDP	The Log of Real Gross Domestic Product per Capita, PPP (constant 2011 international $).	World Development Indicators
Natural Res.	The sum of rents from minerals, coal, oil and natural gas (% of GDP).	World Development Indicators
Aid	Net Official development assistance (% GDP).	World Development Indicators
FDI	Foreign Direct Investment (% of GDP).	
Trade	International Trade (% of GDP).	World Development Indicators
Polity	Polity2 index (-10 to 10) measures the democratic accountability of the political system (with higher scores given to political systems that are more democratic).	Polity IV Project
Conflict	This index measures the risk of violence in a country. Index Range: 0-12 (higher scores given to countries with less conflict).	PRS Group
Press Freedom	This rating assesses the degree of print, broadcast, and digital media freedom. Index Range: 0-100 (Lower scores given to countries with a freer press).	Freedom House
Corruption	The Bayesian Corruption Indicator (BCI) is a composite index of the perceived level of public corruption in a given country. Index Range: 0-100 (with higher scores given to countries with higher levels of corruption).	Standaert (2015)
EITI	This is a binary variable where 1 denotes that country *i* has publicly committed to implementing the EITI between 2003 and 2016, and 0 if they have not committed to the EITI during this period.	EITI online country index
EITI Compliant	This is a binary variable where 1 denotes that country *i* has been verified compliant with the EITI standard between 2003 and 2016, and 0 if they have not committed to the EITI during this period.	EITI online country index
PRS	The Political Risk Services (PRS) Group corruption indicator is an assessment of corruption within the	PRS Group

Variable	Description	Data Source
	political system. Index Range: 0-6 (lower scores represent higher levels of corruption).	
CCI	The Control of Corruption Index measures the extent to which public power is exercised for private gain. Index Range: -2.5 to 2.5 (lower scores represent higher levels of corruption).	World Governance Indicators
CPI	The Corruption Perceptions Index ranks countries based on how corrupt their public sector is perceived to be. Index Range: 0-10 (lower scores represent higher levels of corruption).	Transparency International

Appendix C.3 Table of variable descriptive statistics

Variables	Obs.	Mean	Std. Dev.	Min	Max
Log GDP (2002)	78	8.481	0.976	6.302	10.695
Natural Res. (2002)	78	5.212	9.400	0	39.114
Aid (2002)	78	4.769	5.861	0	31.325
FDI (2002)	78	3.042	4.286	-4.894	32.466
Trade (2002)	78	70.728	36.187	0.511	199.356
Polity (2002)	78	3.064	5.856	-10	10
Conflict (2002)	78	8.408	1.761	2.958	11.25
Press Freedom (2002)	78	52.769	19.359	14	94
Corruption (1997)	78	54.191	9.765	28.132	69.425
Corruption (2002)	78	54.503	10.312	26.928	70.515
Corruption (2016)	78	53.667	10.857	26.088	74.889
EITI	78	0.423	0.497	0	1
EITI Compliant	66	0.318	0.469	0	1
EITI (time)	78	3.358	4.626	0	13
EITI Compliant (time)	66	2.061	1.242	0	7
PRS (2002)	78	2.043	0.726	0	4
PRS (2016)	78	2.199	0.696	1	4.5
CCI (2002)	78	-0.489	0.646	-1.685	1.592
CCI (2016)	78	-0.474	0.568	-1.552	1.267
CPI (2002)	57	32.140	12.834	12	75
CPI(2016)	57	36.578	11.274	17	71

Appendix C.4 Changes in corruption scores: Alternative Indicators

		Panel A: PRS Group Corruption Indicator			
		Control		Adj. Control	
	Obs.	Chg	DiD	Chg	DiD
EITI [2002-2016]	78	-0.348** (0.145)	0.313 (0. 234)	-	-
EITI Compliant [2002-2016]	66	-0.348** (0.145)	0.282 (0.019)	0.037* (0.021)	-0.041 (0.026)
		Panel B: Control of Corruption Index (CCI)			
EITI [2002-2016]	78	0.040 (0.075)	-0.151 (0.117)	0.374*** (0.140)	-0.485*** (0.167)
EITI Compliant [2002-2016]	66	0.040 (0.075)	-0.262** (0.125)	0.391** (0.159)	-0.613*** (0.187)
		Panel C: Corruption Perception Index (CPI)			
EITI [2002-2016]	57	-0.284*** (0.089)	-0.175 (0.144)	-0.280** (0.126)	-0.179 (0.168)
EITI Compliant [2002-2016]	49	-0.284*** (0.089)	-0.300* (0.161)	-	-

Notes: Chg provides the change in the corruption scores in the control group measured in standard deviations (i.e. the parameter α in the difference-in-difference regression equation in Section 3.2). DiD reports the corresponding difference-in-differences between the EITI and control group (i.e. the β coefficient in the difference-in-difference regression equation in Section 3.2). The results are estimated using OLS regressions. Control refers to the estimates using the unweighted control group and Adj. Control the estimates using the weighted control group; weights are derived from the entropy balancing approach described above. Obs. is the number of countries included in the analysis. The signs on the coefficients for chg (i.e. α) and DID (i.e. β) are inverted reflecting that the scales for these indices point in the opposite direction to BCI's. Superscripts *, **, *** correspond to a 10%, 5% and 1% level of significance. Robust standard errors are reported in parenthesis ().

Appendix D

Appendix D.1 List of countries in sample and EITI status

Country	Commitment	Candidate	Compliant
Albania	2009	2009	2013
Argentina			
Armenia			
Azerbaijan	2003	2007	2009
Burundi			
Benin			
Bangladesh			
Bahrain			
Bosnia and Herzegovina			
Bolivia			
Brazil			
Barbados			
Bhutan			
Botswana			
Chile			
China			
Cote d'Ivoire	2007	2008	2013
Cameroon	2005	2007	2013
Congo, Dem. Rep.	2005	2007	2014
Colombia	2013	2014	
Cabo Verde			
Costa Rica			
Dominican Republic	2016	2016	
Algeria			
Ecuador			
Egypt, Arab Rep.			
Ethiopia	2009	2014	
Gabon	2004	2007	
Georgia			
Ghana	2003	2007	2010
Gambia, The			
Guatemala	2010	2011	2014
Honduras	2012	2013	
Croatia			
Indonesia	2008	2010	2014
India			
Iran, Islamic Rep.			
Jamaica			
Jordan			

Country	Commitment	Candidate	Compliant
Kazakhstan	2005	2007	2013
Kenya			
Kyrgyz Republic	2004	2007	2011
Cambodia			
Lao PDR			
Lebanon			
Liberia	2007	2008	2009
Sri Lanka			
Lesotho			
Morocco			
Moldova			
Madagascar	2008	2008	
Mexico	2015	2017	
Macedonia, FYR			
Mali	2006	2007	2011
Malta			
Mongolia	2006	2007	2010
Mozambique	2008	2009	2012
Mauritania	2005	2007	2012
Mauritius			
Malawi	2014	2015	
Malaysia			
Namibia			
Nigeria	2003	2007	2011
Nicaragua			
Nepal			
Oman			
Pakistan			
Panama			
Peru	2005	2007	2012
Philippines	2012	2013	
Paraguay			
Rwanda			
Saudi Arabia			
Senegal	2012	2013	
Sierra Leone	2006	2008	2014
El Salvador			
Serbia			
Slovenia			
Chad	2007	2010	2014
Thailand			
Tajikistan	2012	2013	
Trinidad and Tobago	2010	2011	2015

Country	Commitment	Candidate	Compliant
Tunisia			
Turkey			
Tanzania	2008	2009	2012
Uganda			
Uruguay			
Venezuela, RB			
Vietnam			
Yemen, Rep.	2007	2007	2011
South Africa			
Zambia	2008	2009	2012
Zimbabwe			

Appendix D.2 Table of variable descriptions

Variables	Description	Data Source
Trust	This indicator measures the extent that respondents rate the ethical standards of politicians in country *i*. Index Range: 1-7 (with higher values indicating higher levels trust).	Open Trade and Competitiveness database
Commit	This is a binary variable where 1 denotes that country *i* is publicly committed to implementing the EITI in year *t*, and 0 if they are not.	EITI online country index
Candidate	This is a binary variable where 1 denotes that country *i* is verified a EITI candidate country in year *t*, and 0 they are not.	EITI online country index
Compliant	This is a binary variable where 1 denotes that country *i* is verified a EITI-compliant member in year *t*, and 0 if they are not.	EITI online country index
Neighbour	This is a binary variable where 1 denotes that country *i* has a neighbour country that has committed to the EITI in year *t*, and 0 if they are not. Further specifications provide alternative binary measures of this variable based on neighbour candidacy and compliance status. They also use a measure of the proportion of neighbours with a particular EITI status.	geodatasource.com
Natural Res.	The sum of rents from minerals, coal, oil and natural gas (% of GDP).	World Development Indicators
Aid	Net Official development assistance (% GDP).	World Development Indicators
Trade	International Trade (% of GDP).	World Development Indicators
		World Development Indicators

Variables	Description	Data Source
FDI	Foreign Direct Investment (% of GDP).	
Polity	Polity2 index (-10 to 10) measures the democratic accountability of the political system (with higher scores given to political systems that are more democratic).	Polity IV Project
Conflict	This index measures the risk of violence in a country. Index Range: 0-12 (higher scores given to countries with less conflict).	PRS Group
Freedom	This rating assesses the degree of print, broadcast, and digital media freedom. Index Range: 0-100 (Lower scores given to countries with a freer press).	Freedom House
Corruption	The Bayesian Corruption Indicator (BCI) is a composite index of the perceived level of public corruption in a given country. Index Range: 0-100 (with higher scores given to countries with higher levels of corruption).	Standaert (2015)

Appendix D.3 Table of Descriptive Statistics

Variables	Mean	Std. Dev.	Min	Max
Trust	2.733	0.903	1.251	5.794
Commit	0.298	0.458	0	1
Candidate	0.238	0.426	0	1
Compliant	0.113	0.317	0	1
Neighbour	0.259	0.438	0	1
Natural Res.	6.991	10.291	0	53.961
Log GDP	8.783	0.987	6.552	10.834
Aid	4.191	5.679	-0.675	46.254
Trade	83.185	40.689	21.447	325.998
FDI	6.049	21.231	-7.438	451.716
Polity	3.862	5.647	-10	10
Conflict	8.792	1.448	4.625	11.5
Freedom	54.113	18.223	15	92
Corruption	53.234	11.404	22.837	73.928
Corrupt*Nat.	372.64	549.635	0	3344.746

Appendix D.4 Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) Trust	1.000														
(2) Commit	-0.041	1.000													
(3) Candidate	-0.034	0.872	1.000												
(4) Compliant	0.063	0.546	0.626	1.000											
(5) Neighbour	-0.063	0.007	-0.017	-0.045	1.000										
(6) Natural Res.	0.170	0.270	0.263	0.251	0.072	1.000									
(7) Log GDP	0.196	-0.302	-0.255	-0.125	0.001	0.270	1.000								
(8) Aid	-0.019	0.230	0.194	0.152	0.054	-0.099	-0.725	1.000							
(9) Trade	0.243	-0.094	-0.104	-0.041	-0.051	0.104	0.125	0.066	1.000						
(10) FDI	0.147	0.199	0.199	0.202	-0.037	0.167	-0.063	0.296	0.321	1.000					
(11) Polity	-0.360	-0.033	-0.042	-0.026	-0.070	-0.295	0.103	-0.087	-0.028	0.060	1.000				
(12) Conflict	0.240	-0.062	-0.052	-0.073	0.051	0.069	0.229	-0.008	0.398	0.232	0.122	1.000			
(13) Freedom	0.173	0.010	0.008	-0.008	0.025	0.202	-0.048	0.003	0.010	-0.093	-0.739	-0.209	1.000		
(14) Corruption	-0.775	0.281	0.253	0.143	0.051	-0.015	-0.398	0.166	-0.238	-0.109	0.068	-0.306	0.075	1.000	
(15) Corrupt*Nat.	0.027	0.325	0.315	0.284	0.072	0.956	0.182	-0.071	0.075	0.156	-0.243	0.031	0.185	0.162	1.000

Appendix D.5 Random- and Fixed-Effects Regressions on Trust in Politicians: Rich Specifications (Exc. corruption and conflict variables)

	(1) RE	(2) RE	(3) RE	(4) FE	(5) FE	(6) FE
Commit	-0.001			0.056		
	(0.150)			(0.154)		
Candidate		0.033			0.081	
		(0.102)			(0.107)	
Compliant			0.200*			0.224*
			(0.115)			(0.120)
Natural Res.	-0.005	-0.006	-0.004	-0.004	-0.003	-0.001
	(0.006)	(0.006)	(0.005)	(0.006)	(0.007)	(0.007)
Log GDP	0.503***	0.505***	0.495***	1.078***	1.069***	1.012***
	(0.128)	(0.128)	(0.128)	(0.367)	(0.365)	(0.365)
Aid	0.005	0.005	0.004	-0.006	-0.006	-0.006
	(0.009)	(0.009)	(0.009)	(0.008)	(0.008)	(0.008)
Trade	-0.001	-0.001	-0.001	-0.003	-0.003	-0.003
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
FDI	0.006**	0.005*	0.005	0.003	0.003	0.003
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Polity	-0.027*	-0.027*	-0.026*	-0.010	-0.010	-0.011
	(0.015)	(0.015)	(0.015)	(0.018)	(0.018)	(0.018)
Freedom	0.004	0.005	0.005	0.009	0.009	0.010
	(0.009)	(0.009)	(0.008)	(0.012)	(0.012)	(0.011)
Constant	-4.443***	-4.470***	-4.382***	-9.747***	-9.670***	-9.189***
	(1.485)	(1.471)	(1.452)	(3.485)	(3.467)	(3.465)
Obs.	794	794	794	794	794	794
R-squared	0.256	0.253	0.242	0.157	0.159	0.172

Notes: Robust standard errors of coefficients in parentheses. Superscripts *, **, *** correspond to a 10, 5 and 1 per cent level of significance.

Appendix D.6 Random- and Fixed-Effects Regressions on Trust in Politicians: Parsimonious Specifications (Inc. Natural Resource variable)

	(1) RE	(2) RE	(3) RE	(4) FE	(5) FE	(6) FE
Commit	0.035			0.087		
	(0.134)			(0.144)		
Candidate		0.048			0.079	
		(0.095)			(0.099)	
Compliant			0.221**			0.235**
			(0.109)			(0.111)
Natural Res.	-0.003	-0.003	-0.001	-0.005	-0.004	-0.002
	(0.005)	(0.005)	(0.004)	(0.005)	(0.005)	(0.005)
Constant	0.152	0.151	0.153	-0.287***	-0.287***	-0.296***
	(0.299)	(0.298)	(0.300)	(0.071)	(0.069)	(0.066)
Obs.	901	901	901	901	901	901
R-squared	0.179	0.178	0.179	0.102	0.102	0.116

Notes: Robust standard errors of coefficients in parentheses. Superscripts *, **, *** correspond to a 10, 5 and 1 per cent level of significance.

Appendix D.7 Instrumental Variable Regressions on Trust in Politicians: Rich Specifications (Exc. corruption and conflict variables)

	(1) 1-2SLS	**(1)** 2-2SLS	**(2)** 1-2SLS	**(2)** 2-2SLS	**(3)** 1-2SLS	**(3)** 2-2SLS
Commit		0.307**				
		(0.136)				
Candidate				0.248		
				(0.167)		
Compliant						0.113
						(0.135)
Pr_{EITI}	1.026***		0.978***		1.054***	
	(0.063)		(0.077)		(0.043)	
Natural Res.	-0.000	-0.003	-0.000	-0.001	-0.000	0.001
	(0.003)	(0.009)	(0.004)	(0.009)	(0.003)	(0.009)
Log GDP	0.032	0.376	0.004	0.299	0.028	0.181
	(0.158)	(0.447)	(0.193)	(0.451)	(0.118)	(0.476)
Aid	-0.001	-0.011	-0.000	-0.011	-0.000	-0.008
	(0.005)	(0.011)	(0.006)	(0.011)	(0.003)	(0.012)
Trade	-0.000	0.003	0.000	0.003	0.000	0.003
	(0.001)	(0.004)	(0.001)	(0.004)	(0.001)	(0.004)
FDI	-0.000	-0.003	-0.000	-0.003	-0.000	-0.003
	(0.001)	(0.006)	(0.002)	(0.006)	(0.001)	(0.006)
Polity	0.000	0.026	-0.002	0.022	0.001	0.013
	(0.009)	(0.037)	(0.010)	(0.037)	(0.009)	(0.039)
Freedom	0.000	-0.001	-0.001	-0.001	0.001	-0.005
	(0.004)	(0.010)	(0.003)	(0.010)	(0.003)	(0.010)
Constant	0.079	-4.217***	-0.029	-3.968***	-0.022	-3.886***
	(0.503)	(1.461)	(0.674)	(1.442)	(0.555)	(1.320)
Obs.	537	537	537	537	486	486
Instrument F-stat.	261		160		585	

Notes: Robust standard errors of coefficients in parentheses. Superscripts *, **, *** correspond to a 10, 5 and 1 per cent level of significance.

Appendix E

Appendix E.1 List of countries in sample and EITI status.

Country	EITI	EITI (Supporter)	EITI (Time)	EITI (Meaningful)	EITI (Satisfactory)
Afghanistan	1	0	9	1	0
Albania	1	0	10	1	0
Algeria	0	0	0	0	0
American Samoa	0	0	0	0	0
Andorra	0	0	0	0	0
Angola	0	0	0	0	0
Antigua & Barbuda	0	0	0	0	0
Argentina	1	0	0	-	-
Armenia	1	0	2	0	1
Aruba	0	0	0	0	0
Australia	0	1	0	0	0
Austria	0	0	0	0	0
Azerbaijan	0	0	10	0	0
Bahamas	0	0	0	0	0
Bahrain	0	0	0	0	0
Bangladesh	0	0	0	0	0
Barbados	0	0	0	0	0
Belarus	0	0	0	0	0
Belgium	0	1	0	0	0
Belize	0	0	0	0	0
Benin	0	0	0	0	0
Bermuda	0	0	0	0	0
Bhutan	0	0	0	0	0
Bolivia	0	0	0	0	0
Bosnia & Herz.	0	0	0	0	0
Botswana	0	0	0	0	0
Brazil	0	0	0	0	0
British Virgin Is.	0	0	0	0	0
Brunei Darussalam	0	0	0	0	0
Bulgaria	0	0	0	0	0
Burkina Faso	1	0	10	1	0
Burundi	0	0	0	0	0
Cabo Verde	0	0	0	0	0
Cambodia	0	0	0	0	0
Cameroon	1	0	12	1	0
Canada	0	1	0	0	0
Cayman Islands	0	0	0	0	0
Central African Rep.	1	0	11	-	-

Country	EITI	EITI (Supporter)	EITI (Time)	EITI (Meaningful)	EITI (Satisfactory)
Chad	1	0	9	1	0
Chile	0	0	0	0	0
China	0	0	0	0	0
Colombia	1	0	5	0	1
Comoros	0	0	0	0	0
Congo, Dem Rep	1	0	12	1	0
Congo, Rep	1	0	12	1	0
Costa Rica	0	0	0	0	0
Cote d'Ivoire	1	0	11	1	0
Croatia	0	0	0	0	0
Cuba	0	0	0	0	0
Curacao	0	0	0	0	0
Cyprus	0	0	0	0	0
Czech Republic	0	0	0	0	0
Denmark	0	1	0	0	0
Djibouti	0	0	0	0	0
Dominica	0	0	0	0	0
Dominican Republic	1	0	3	1	0
Ecuador	0	0	0	0	0
Egypt, Arab Rep	0	0	0	0	0
El Salvador	0	0	0	0	0
Equatorial Guinea	0	0	2	0	0
Estonia	0	0	0	0	0
Eswatini	0	0	0	0	0
Ethiopia	1	0	5	1	0
Faroe Islands	0	0	0	0	0
Fiji	0	0	0	0	0
Finland	0	1	0	0	0
France	0	1	0	0	0
French Polynesia	0	0	0	0	0
Gabon	0	0	6	0	0
Gambia	0	0	0	0	0
Georgia	0	0	0	0	0
Germany	1	1	3	0	1
Ghana	1	0	12	1	0
Gibraltar	0	0	0	0	0
Greece	0	0	0	0	0
Greenland	0	0	0	0	0
Grenada	0	0	0	0	0
Guam	0	0	0	0	0
Guatemala	1	0	8	-	-
Guinea	1	0	12	1	0

Country	EITI	EITI (Supporter)	EITI (Time)	EITI (Meaningful)	EITI (Satisfactory)
Guinea-Bissau	0	0	0	0	0
Guyana	1	0	2	-	-
Haiti	0	0	0	0	0
Honduras	1	0	6	-	-
Hong Kong, China	0	0	0	0	0
Hungary	0	0	0	0	0
Iceland	0	0	0	0	0
India	0	0	0	0	0
Indonesia	1	0	9	1	0
Iran, Islamic Rep	0	0	0	0	0
Iraq	1	0	9	1	0
Ireland	0	0	0	0	0
Israel	0	0	0	0	0
Italy	0	0	0	0	0
Jamaica	0	0	0	0	0
Japan	0	1	0	0	0
Jordan	0	0	0	0	0
Kazakhstan	1	0	12	1	0
Kenya	0	0	0	0	0
Kiribati	0	0	0	0	0
Kosovo	0	0	0	0	0
Kuwait	0	0	0	0	0
Kyrgyz Republic	1	0	12	1	0
Lao PDR	0	0	0	0	0
Latvia	0	0	0	0	0
Lebanon	0	0	0	0	0
Lesotho	0	0	0	0	0
Liberia	1	0	11	1	0
Libya	0	0	0	0	0
Liechtenstein	0	0	0	0	0
Lithuania	0	0	0	0	0
Luxembourg	0	0	0	0	0
Macao SAR, China	0	0	0	0	0
Madagascar	1	0	11	1	0
Malawi	1	0	4	1	0
Malaysia	0	0	0	0	0
Maldives	0	0	0	0	0
Mali	1	0	12	1	0
Malta	0	0	0	0	0
Marshall Islands	0	0	0	0	0
Mauritania	1	0	12	1	0
Mauritius	0	0	0	0	0

Country	EITI	EITI (Supporter)	EITI (Time)	EITI (Meaningful)	EITI (Satisfactory)
Mexico	1	0	2	-	-
Moldova	0	0	0	0	0
Monaco	0	0	0	0	0
Mongolia	1	0	12	0	1
Montenegro	0	0	0	0	0
Morocco	0	0	0	0	0
Mozambique	1	0	10	1	0
Myanmar	1	0	5	1	0
Namibia	0	0	0	0	0
Nepal	0	0	0	0	0
Netherlands	1	1	1	-	-
New Caledonia	0	0	0	0	0
New Zealand	0	0	0	0	0
Nicaragua	0	0	0	0	0
Niger	1	0	10	-	-
Nigeria	1	0	12	0	1
North Macedonia	0	0	0	0	0
N. Mariana Is.	0	0	0	0	0
Norway	1	1	10	0	1
Oman	0	0	0	0	0
Pakistan	0	0	0	0	0
Panama	0	0	0	0	0
Papua New Guinea	1	0	5	1	0
Paraguay	0	0	0	0	0
Peru	1	0	12	1	0
Philippines	1	0	6	0	1
Poland	0	0	0	0	0
Portugal	0	0	0	0	0
Puerto Rico	0	0	0	0	0
Qatar	0	0	0	0	0
Romania	0	0	0	0	0
Russian Federation	0	0	0	0	0
Rwanda	0	0	0	0	0
Samoa	0	0	0	0	0
Sao Tome & Prin.	1	0	11	1	0
Saudi Arabia	0	0	0	0	0
Senegal	1	0	6	0	1
Serbia	0	0	0	0	0
Seychelles	1	0	5	1	0
Sierra Leone	1	0	11	1	0
Singapore	0	0	0	0	0
St Maarten (Dutch)	0	0	0	0	0

Country	EITI	EITI (Supporter)	EITI (Time)	EITI (Meaningful)	EITI (Satisfactory)
Slovak Republic	0	0	0	0	0
Slovenia	0	0	0	0	0
Solomon Islands	0	0	6	0	0
Somalia	0	0	0	0	0
South Africa	0	0	0	0	0
South Sudan	0	0	0	0	0
Spain	0	0	0	0	0
Sri Lanka	0	0	0	0	0
St Lucia	0	0	0	0	0
St Vincent & Gren.	0	0	0	0	0
Sudan	0	0	0	0	0
Suriname	1	0	2	1	0
Sweden	0	1	0	0	0
Switzerland	0	1	0	0	0
Syrian Arab Rep.	0	0	0	0	0
Tajikistan	1	0	6	1	0
Tanzania	1	0	10	1	0
Thailand	0	0	0	0	0
Timor-Leste	1	0	11	0	1
Togo	1	0	9	1	0
Tonga	0	0	0	0	0
Trinidad & Tobago	1	0	8	1	0
Tunisia	0	0	0	0	0
Turkey	0	0	0	0	0
Turkmenistan	0	0	0	0	0
Turks and Caicos Is.	0	0	0	0	0
Tuvalu	0	0	0	0	0
Uganda	0	0	0	0	0
Ukraine	1	0	6	1	0
United Arab Emirates	0	0	0	0	0
United Kingdom	1	1	5	1	0
United States	0	1	3	0	0
Uruguay	0	0	0	0	0
Uzbekistan	0	0	0	0	0
Vanuatu	0	0	0	0	0
Venezuela, RB	0	0	0	0	0
Vietnam	0	0	0	0	0
Virgin Islands (US)	0	0	0	0	0
Yemen, Rep	0	0	10	0	0
Zambia	1	0	10	1	0
Zimbabwe	0	0	0	0	0

Note: Missing validation data reflects that some EITI countries did not undertake a validation assessment under the 2016 rule by 2019 because they were still new to the scheme or because they had been suspended from the initiative preventing them from completing the assessment.

Appendix E.2 Table of variable descriptions

Variables	Description	Data Source
Log of users	Log of the aggregate monthly global number of users visiting the EITI's website.	EITI
Mineral Prices	Monthly world commodity price index for mineral and metal prices.	The World Bank's Commodity Price Data Series (Pink Sheet)
Log of users pc	Log of the number of visitors per capita in 2019.	EITI
EITI	This is a binary variable where 1 denotes that country *i* is a member of the EITI, and equals 0 if they are not an EITI member.	EITI
EITI (supporter)	This is a binary variable where 1 denotes that country *i* is a bilateral EITI-supporting country and 0 if they are not.	EITI
EITI (time)	A measure of the number of years each country has been formally registered as a member of the EITI.	EITI
EITI (Meaningful)	This is a binary variable where 1 denotes that country *i* has been evaluated during an EITI validation assessment as having made 'meaningful progress', and equals 0 if they have not.	EITI
EITI (Satisfactory)	This is a binary variable where 1 denotes that country i has been evaluated during an EITI validation assessment as having made "satisfactory progress", and equals 0 if they have not.	EITI
Internet	The percentage of the population using the internet.	ITU ICT indicators
Education	Secondary school enrolment (% gross).	World Development Indicators

Variables	Description	Data Source
Mineral Dependency	The sum of the fraction of mineral, coal, oil and natural gas rents in GDP.	World Development Indicators
Control of Corruption	The Control of Corruption Index measures the extent to which public power is exercised for private gain. Index Range: -2.5 to 2.5 (lower scores represent higher levels of corruption).	World Governance Indicators
Voice & Accountability	The Voice and Accountability Index captures perceptions of the extent to which a country's citizens can participate in selecting their government, as well as freedom of expression, freedom of association, and a free media. Index Range: -2.5 to 2.5 (higher scores represent higher levels of voice and accountability).	World Governance Indicators
Ethnic Frac.	The likelihood two people chosen at random within a given country will be from different ethnic groups. The ethnic fractionalisation index ranges from 0 to 1. A score of 0 indicates there is no ethnic fractionalisation and all individuals are members of the same ethnic group. A score of 1 indicates each individual belongs to his or her own ethnic group.	Drazanova's (2020)
Absence of Violence	The Political Stability and Absence of Violence Index measures the perceptions of the likelihood of political instability and politically motivated violence. Index Range: -2.5 to 2.5 (higher scores represent higher levels of political stability with a lower likelihood of violence).	World Governance Indicators
Log GDP pc	Log of Real Gross Domestic Product per capita.	World Development Indicators
Openness	International Trade (% of GDP).	World Development Indicators

Variables	Description	Data Source
ODA	Net Official development assistance (% GDP).	World Development Indicators

Appendix E.3 Lagrange multiplier test for autocorrelation in the residuals

Lag	Chi-squared statistic	P-value	Test result
1	5.486	0.240	Do not reject null
2	0.496	0.973	Do not reject null
3	3.022	0.553	Do not reject null
4	6.954	0.138	Do not reject null
5	3.399	0.493	Do not reject null

Notes: The results indicate that we do not reject the test null hypothesis of no residual autocorrelation for the first order residual or the higher-order lags that follow in the table.

Appendix E.4 Augmented Dicky–Fuller (ADF) unit root test results

Variable	Test statistic	5% critical value	1% critical value	Test result
Log of users	-0.664	-2.944	-3.614	Do not reject null
Log mineral prices	-1.368	-2.944	-3.614	Do not reject null
Δ Log of users	-5.169	-2.947	-3.621	Reject null
Δ Log of mineral prices	-3.608	-2.947	-3.621	Reject null*

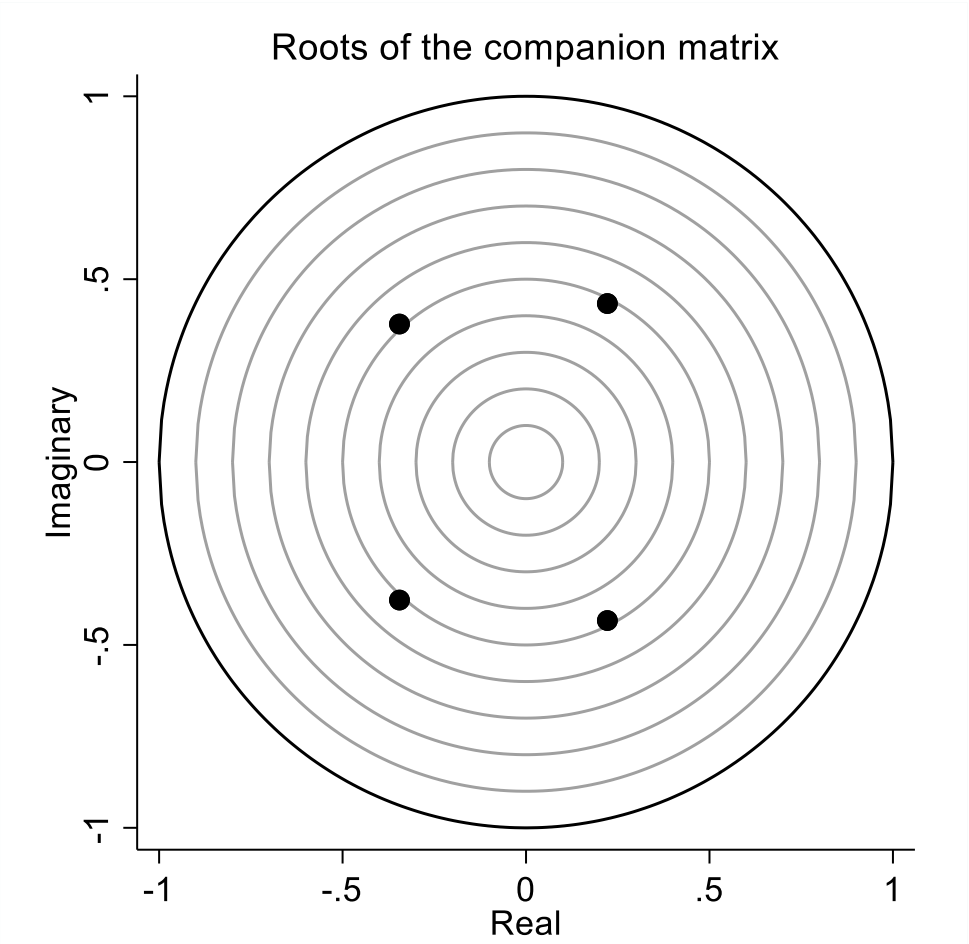
Note: * Reject null using 5% critical value. The test's null hypothesis indicates the series is non-stationary and we reject the null hypothesis when the reported test statistic is larger than the critical values in the table. The results in the table show that we do not reject the null hypothesis when the variables are in levels but we do reject the null hypothesis when the variables are differenced.

Appendix E.5

r	Trace statistic	5% critical value	1% critical value	Test result
0	7.087	15.41	20.04	Do not reject null

The null hypothesis of the trace statistic implies that there are more than r cointegrating relations. For r = 0, the results in the table indicate the trace statistic is less than the convention 1% and 5% critical values. This implies that we do not reject the null hypothesis of no cointegrating equations.

Appendix E.6 Graph of VAR Stability Test Results



Appendix E.7 Cross-country OLS regressions on the log of the number of users per capita (2019) using a limited sample

	(1) Log of users pc	(2) Log of users pc	(3) Log of users pc	(4) Log of users pc	(5) Log of users pc	(6) Log of users pc
EITI	1.067***			0.892***		
	(0.128)			(0.146)		
EITI (supporter)	-0.003	0.039	0.043	0.394*	0.397**	0.427*
	(0.234)	(0.206)	(0.235)	(0.234)	(0.198)	(0.238)
EITI (time)		0.109***			0.104***	
		(0.012)			(0.013)	
EITI (Meaningful)			1.102***			0.933***
			(0.143)			(0.162)
EITI (Satisfactory)			1.155***			1.117***
			(0.248)			(0.283)
Internet				0.051	0.082	0.045
				(0.157)	(0.155)	(0.158)
Education				-0.102	-0.094	-0.083
				(0.097)	(0.090)	(0.102)
Min. Dep.				0.161***	0.102*	0.133**
				(0.056)	(0.052)	(0.062)
Control of Corrupt.	0.201*	0.204*	0.197*	0.108	0.123	0.080
	(0.106)	(0.106)	(0.108)	(0.114)	(0.110)	(0.117)
Voice & Accountab.	0.240**	0.305***	0.244**	0.237**	0.263**	0.220**
	(0.099)	(0.098)	(0.101)	(0.104)	(0.101)	(0.108)
Absence of Violence	0.331***	0.294***	0.326***	0.343***	0.303***	0.311***
	(0.098)	(0.098)	(0.100)	(0.087)	(0.086)	(0.090)
Log GDP pc				0.057	0.068	0.133
				(0.169)	(0.166)	(0.172)
Openness				0.206***	0.195***	0.213***
				(0.043)	(0.044)	(0.044)
Aid				0.110	0.095	0.188**
				(0.075)	(0.081)	(0.095)
Constant	-0.317***	-0.293***	-0.320***	-0.323***	-0.336***	-0.323***
	(0.061)	(0.064)	(0.062)	(0.068)	(0.067)	(0.068)
Observations	191	191	183	141	141	134
R-squared	0.537	0.517	0.545	0.601	0.620	0.611

Robust standard errors are in parentheses. Superscripts *, **, *** correspond with a 10, 5 and 1% level of significance. Variables have been normalised (exc. EITI) by dividing the difference between each country's value and the variable mean by its standard deviation.

Appendix E.8 Cross-country OLS regressions on the log of the number of users per capita (2019) using a limited sample

	(1) Log of users pc	(2) Log of users pc	(3) Log of users pc	(4) Log of users pc	(5) Log of users pc	(6) Log of users pc
EITI	0.616***	0.927***	0.917***	0.798***	0.977***	0.777***
	(0.159)	(0.160)	(0.161)	(0.153)	(0.142)	(0.153)
Internet		0.447***				0.186
		(0.074)				(0.168)
Education			0.396***			-0.068
			(0.068)			(0.118)
Mineral Dependency				0.171***		0.183***
				(0.057)		(0.066)
Control of Corrupt.				0.407***		0.315***
				(0.093)		(0.106)
Voice & Accountab.				0.342***		0.410***
				(0.100)		(0.098)
Ethnic Frac.				0.052		0.061
				(0.074)		(0.074)
Log GDP pc					0.571***	-0.090
					(0.106)	(0.196)
Openness					0.288***	0.251***
					(0.088)	(0.069)
Aid					0.346*	0.136
					(0.183)	(0.126)
Constant	-0.308***	-0.404***	-0.418***	-0.364***	-0.487***	-0.381***
	(0.103)	(0.090)	(0.095)	(0.075)	(0.103)	(0.089)
Observations	120	120	120	120	120	120
R-squared	0.102	0.305	0.280	0.542	0.452	0.597

Robust standard errors are in parentheses. Superscripts *, **, *** correspond with a 10, 5 and 1% level of significance. Variables have been normalised (exc. EITI) by dividing the difference between each country's value and the variable mean by its standard deviation.

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